26 July 2019

Duane Martin
Town Engineer
Town of West Hartford
50 South Main Street
West Hartford, CT 06107

RE: Stormwater Management
University of St. Joseph
1678 Asylum Avenue
West Hartford, CT
Langan Project No. 140202901

Dear Mr. Martin:

This letter provides an analysis of the existing and proposed peak runoff discharges and the engineering design for the proposed stormwater conveyance system.

PROJECT DESPCRIPTION

Existing Site Conditions

The project site is located at 1678 Asylum Avenue in West Hartford, Connecticut; see Figure 1. The ±82 acre campus consists of university buildings, driveways, parking areas, athletic facilities and open space.

A topographic survey prepared by Langan, shows that grades within the vicinity of the proposed project area vary from about elevation 103 on the east to elevation 130 on the west (NAVD88). There is an existing stormwater collection system on site consisting of catch basins, manholes, yard drains, detention basins and outlet control structures.

Based upon FEMA's Flood Insurance Rate Map (FIRM) Community Panel Number 09003C0361F, effective date September 26, 2008, the project's area is located within Zone X, or areas outside the 100-year flood plain (See Figure 2).

According to the USDA Natural Resources Conservation Service Web Soil Survey, the soil types onsite include Udorthents – Urban land complex, Udorthent, Ludlow Silt Loam, and Brancroft Silt Loam (See Figure 3). These soil types have a hydrological ratings of B and C. There are wetlands on site with the nearest abutting the southeast portion of the project.

Proposed Project

The project includes the construction of a ±24,535 SF addition to the University's O'Connell Athletic Center. The addition will be located directly south of the existing building where there is an existing impervious parking area. Other proposed improvements include revised parking and

drive areas, sidewalks, landscaping, and utilities to serve the proposed addition. Stormwater improvements include a series of catch basins, yard drains, manholes, a swale, and two subsurface detention systems.

PEAK RUNOFF ANALYSIS (See Appendix A)

The stormwater management system is designed to control the rate of runoff from the site's watersheds to be equal or less than existing conditions up to, and including, a 100-year design storm event.

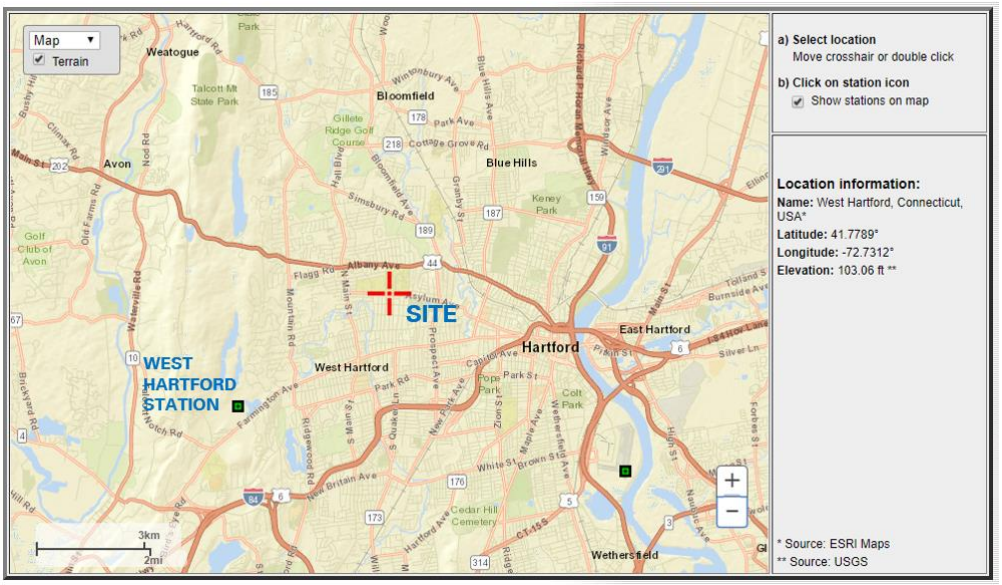
The peak runoff discharges for the existing and proposed conditions were analyzed using Soil Conservation Service (SCS) methodology, which outlines procedures for calculating peak rates of runoff resulting from precipitation events, and procedures for developing runoff hydrographs. Values for area, curve number and time of concentration were calculated for the existing and proposed conditions.

The curve number "CN" is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C and D). The SCS classification system evaluates the runoff potential of a soil according to its infiltration and transmission rates. "A" soils have the lowest runoff potential, and "D" soils have the greatest runoff potential. Soils within the development area predominantly have a hydrologic soil group designation of "B" and "C."

The time of concentration, Tc, is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rates discharging from the site. Precipitation data used for the various storm events is based on the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for West Hartford Station. West Hartford Station was chosen for rainfall data because it is the station located within the closest proximity of the project location as shown in Graphic 1. A summary of all rainfall data utilized in the analysis for this site is provided below and a complete compilation of data provided by NOAA for this location is included in Appendix D.

Graphic 1. NOAA Rainfall Data Location Map



NOAA Precipitation Depth per Average Recurrence Interval [in]				
Duration	**2-Year**	**10-Year**	**25-Year**	**100-Year**
24-hour	3.30	5.30	6.54	8.46

Existing Condition (See Appendix A)

The existing project area is partially developed with an athletic building. Impervious areas include the building roof, surface parking lot, roadways, and sidewalks. Existing watershed A is comprised of about 1.42 acres and includes the existing building. Watershed A collects water via an existing on-site storm drainage system and flows westerly via an existing 24" pipe on campus. This system continues southwest and discharges into an existing drainage system. Existing Watershed B is about 4.24 acres and collects water from the existing parking area within the project site. Watershed B also collects water from up-gradient sources including a cemetery to the east and drive and lawn areas to the south. Watershed B discharges into the wetlands southwest of the project site via an existing drainage pipe.

Proposed Condition (See Appendix B)

In the proposed condition, site hydrology mimics the existing condition. Proposed Watershed A is reduced to 1.29 acres and continues to flow westerly via an existing 24" pipe on campus.

Proposed Watershed B has been further divided into three sub-watersheds for analysis. Watershed B1A is 1.38 acres and collects water from the proposed building roof as well a portion of the offsite flow from the east. Watershed B1A is routed through a proposed below grade stormwater system comprised of arch chambers and stone bedding. Watershed B1B is 0.70 acres and collects runoff from the proposed parking and drive areas. Watershed B1B is then routed through an oversized below grade pipe which provides detention on site. Watershed B2 is 2.47 acres and collects the majority of runoff from areas outside of the project limits. Runoff from Watersheds B1A, B1B, and B2 combine within a proposed on-site manhole prior to connecting back into the existing drainage system on site that discharges to the wetlands.

The proposed arch chamber system will be installed on a crushed-stone bed and set to encourage groundwater recharge. Percolation testing has not been completed on-site at the time of this report and no field data indicating soil infiltration capabilities is readily available at this time. Therefore, this system was analyzed without accounting for infiltration and any infiltration realized at the time of construction will be an added benefit. The proposed oversized storage pipe has been designed as a detention facility with no potential for infiltration.

Two stormwater quality inserts are proposed in catch basin locations that collect runoff from the proposed parking and drive areas. Per the 2004 Connecticut Stormwater Quality Manual, these inserts have been design to treat the water quality flow produced by 1" of rainfall. They capture and retain floatables while removing sediment from stormwater runoff. In addition, sumps are provided within each catch basin to further collect sediment.

Site Discharge Peak Flow Comparison for WS-A (CFS)

	Current	Proposed	Delta	% Reduction
2- Year	2.404	2.271	-0.133	5.53%
10-Year	4.541	4.216	-0.325	7.16%
25-Year	5.869	5.419	-0.450	7.67%
100-Year	7.911	7.269	-0.642	8.12%

Site Discharge Peak Flow Comparison for WS-B (CFS)

	Current	Proposed	Delta	% Reduction
2- Year	3.066	2.870	-0.196	6.39%
10-Year	7.789	7.147	-0.642	8.24%
25-Year	11.020	10.990	-0.030	0.27%
100-Year	16.240	16.040	-0.200	1.23%

Site Discharge Peak Flow Comparison for TOTAL SITE (CFS)

	Current	Proposed	Delta	% Reduction
2- Year	5.200	4.839	-0.361	6.94%
10-Year	11.880	11.150	-0.730	6.14%
25-Year	16.320	15.970	-0.350	2.14%
100-Year	23.400	22.970	-0.430	1.84%

STORMWATER CONVEYANCE SYSTEM (See Appendix B)

The Stormwater conveyance system was sized using the Rational Method for the 10-year storm event. Values for area, runoff coefficient, C, and a time of concentration were calculated for each drainage area, see Figure DACB. The average runoff coefficient was calculated based upon the following cover types:

Cover	C
Grass/Pervious	0.3
Gravel	0.6
Roof/Pavement/Impervious	0.9

Rainfall intensities were taken from the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for West Hartford Station. Stormwater pipes were then sized based upon the Manning's Equation for full flow pipe capacity and solving for the hydraulic grade line. The computer program Hydraflow Storm Sewers 2011 by Intellisolve was used in the analysis.

Please refer to the Drawings for additional drainage information.

\\langan.com\data\NHV\data9\140202901\Project Data_Discipline\Site Civil\Reports\Stormwater\2019-07-24 St Joes Stormwater.docx

LIST OF FIGURES

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Fig. 3	**Soil Survey Map**

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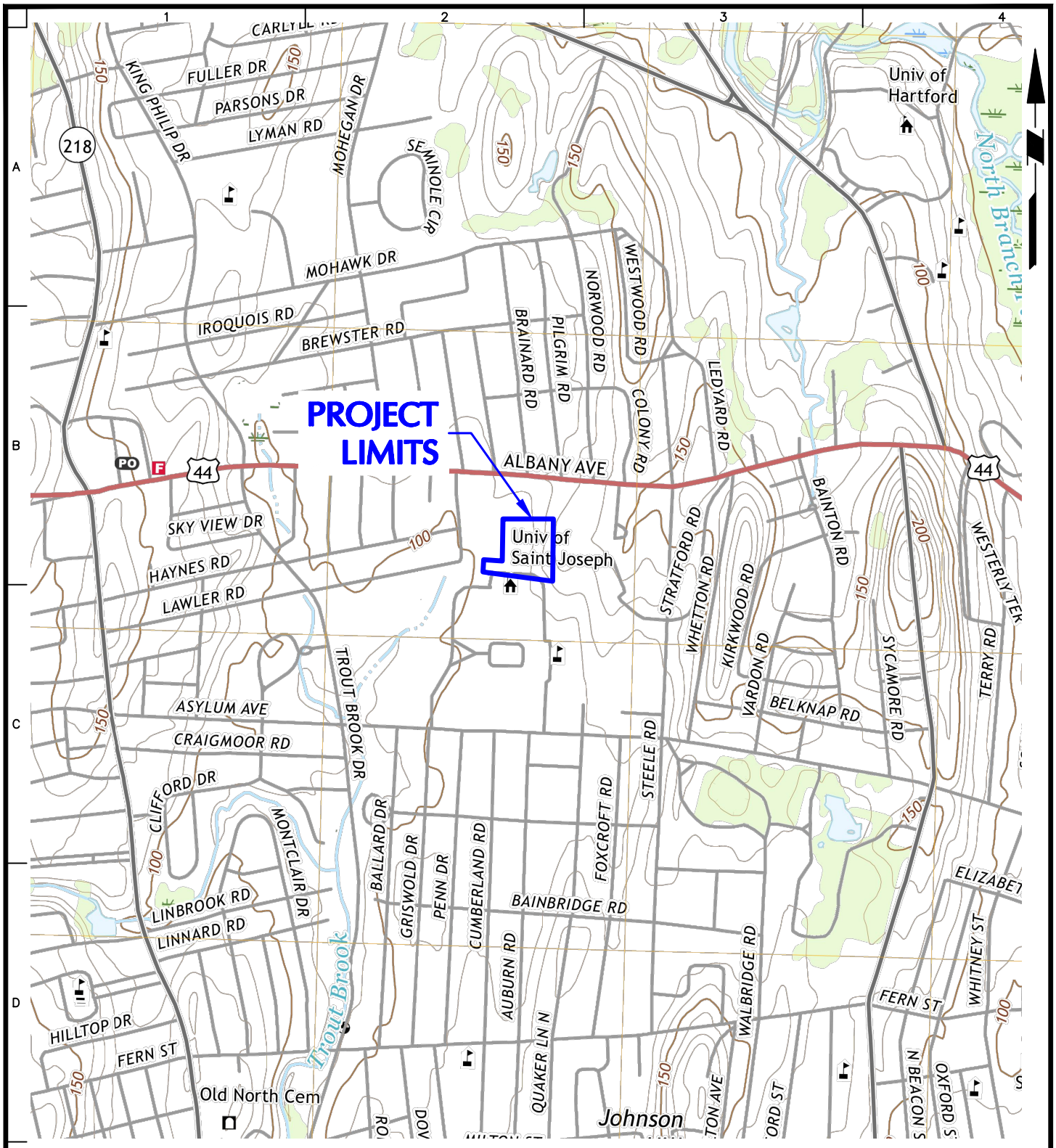
Appendix B	**Proposed Stormwater Discharge Calculations**
Appendix C	**Stormwater Collection System Calculations**
Appendix D	**NOAA Rainfall Data**
Appendix E	**Operation and Maintenance**



REFERENCE: "HARTFORD NORTH QUADRANGLE" HARTFORD COUNTY, CONNECTICUT, U.S. DEPARTMENT OF THE INTERIOR, U.S. GEOLOGICAL SURVEY, DATED 2018.

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SCALE: 1 INCH = 1500 FEET

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Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

Project	USJ O'CONNELL CENTER
	WEST HARTFORD CONNECTICUT
Drawing Title	USGS SITE LOCATION MAP
Project No.	140202901
Date	07/26/2019
Drawn By	AMC
Checked By	CPC
Drawing No.	FIG 01
Sheet	1 of 4

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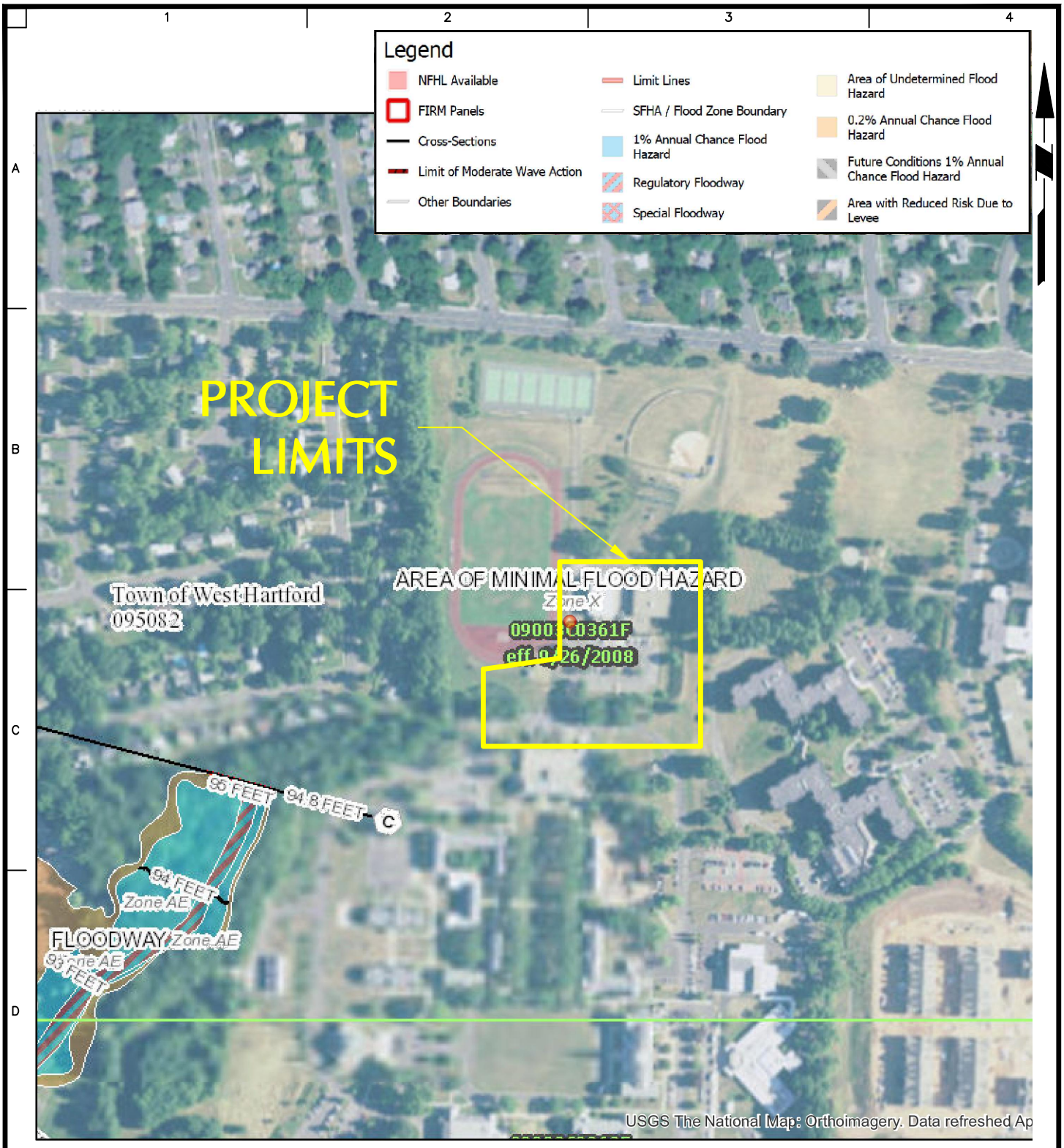

REFERENCE: "FLOOD INSURANCE RATE MAP" WEST HARTFORD COUNTY, CONNECTICUT, FEMA MAP NUMBERS 09003C0361F REVISED TO SEPTEMBER 26, 2008.

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SCALE: 1 INCH = 500 FEET

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Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

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	WEST HARTFORD CONNECTICUT
Drawing Title	EFFECTIVE FEMA FIRM
Project No.	140202901
Date	07/26/2019
Drawn By	AMC
Checked By	CPC
Drawing No.	FIG 02
Sheet	2 of 4

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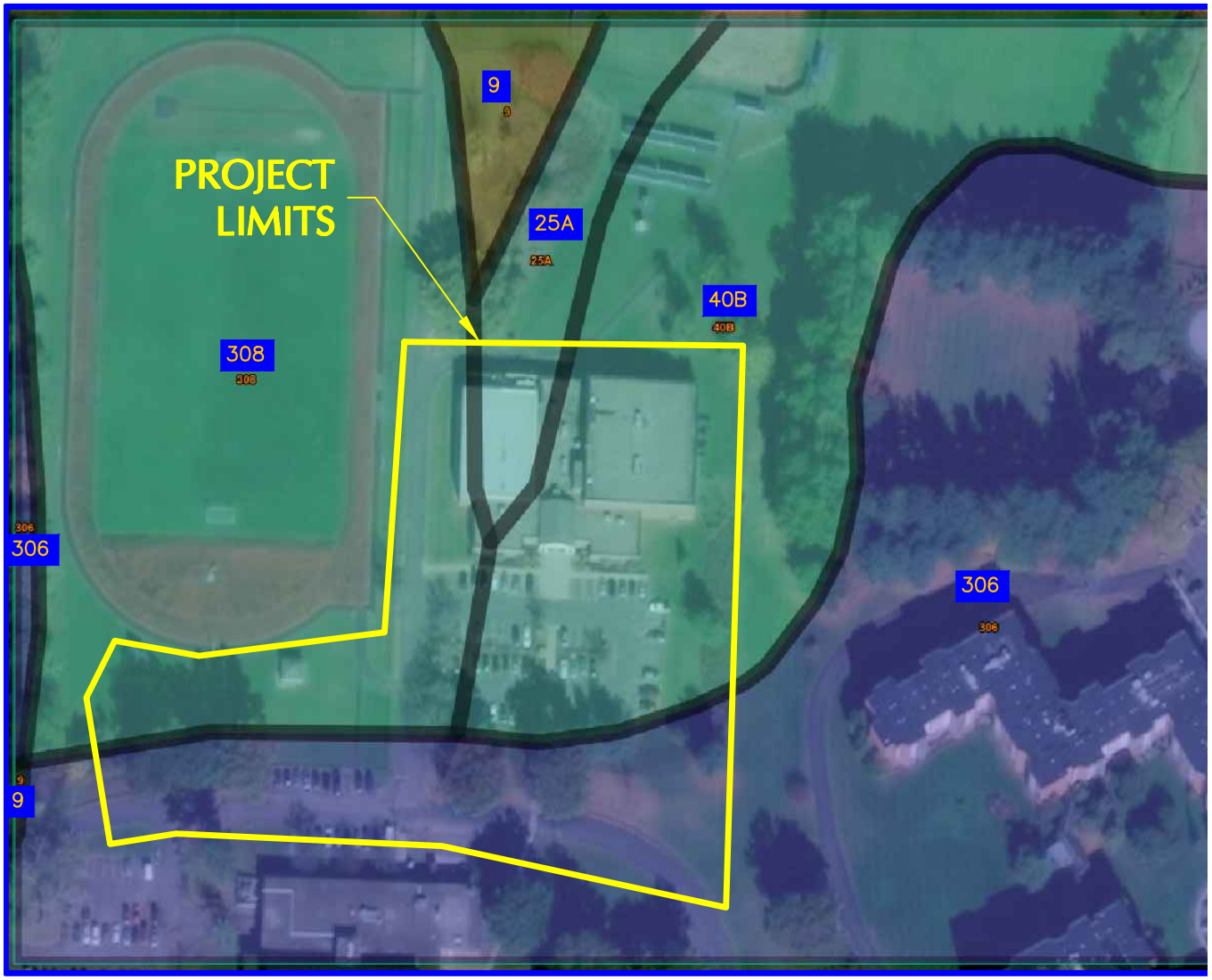

SOIL LEGEND

ID	TYPE	RATING
306	UDORTHENTS–URBAN LAND COMPLEX	B
308	UDORTHENT, SMOOTHED	C
40B	LUDLOW SILT LOAM	C
25A	BRANCROFT SILT LOAM	C
9	SCITICO, SHAKER, ANDMAYBID SOILS	C/D

REFERENCE: WEB SOIL SURVEY BY UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE.

150 0 100 150

SCALE: 1 INCH = 150 FEET

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Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project: USJ O'CONNELL CENTER
WEST HARTFORD CONNECTICUT

Drawing Title: NRCS SOIL MAP

Project No. 140202901
Date 07/26/2019
Drawn By AMC
Checked By CPC

Drawing No. FIG 03
Sheet 3 of 4

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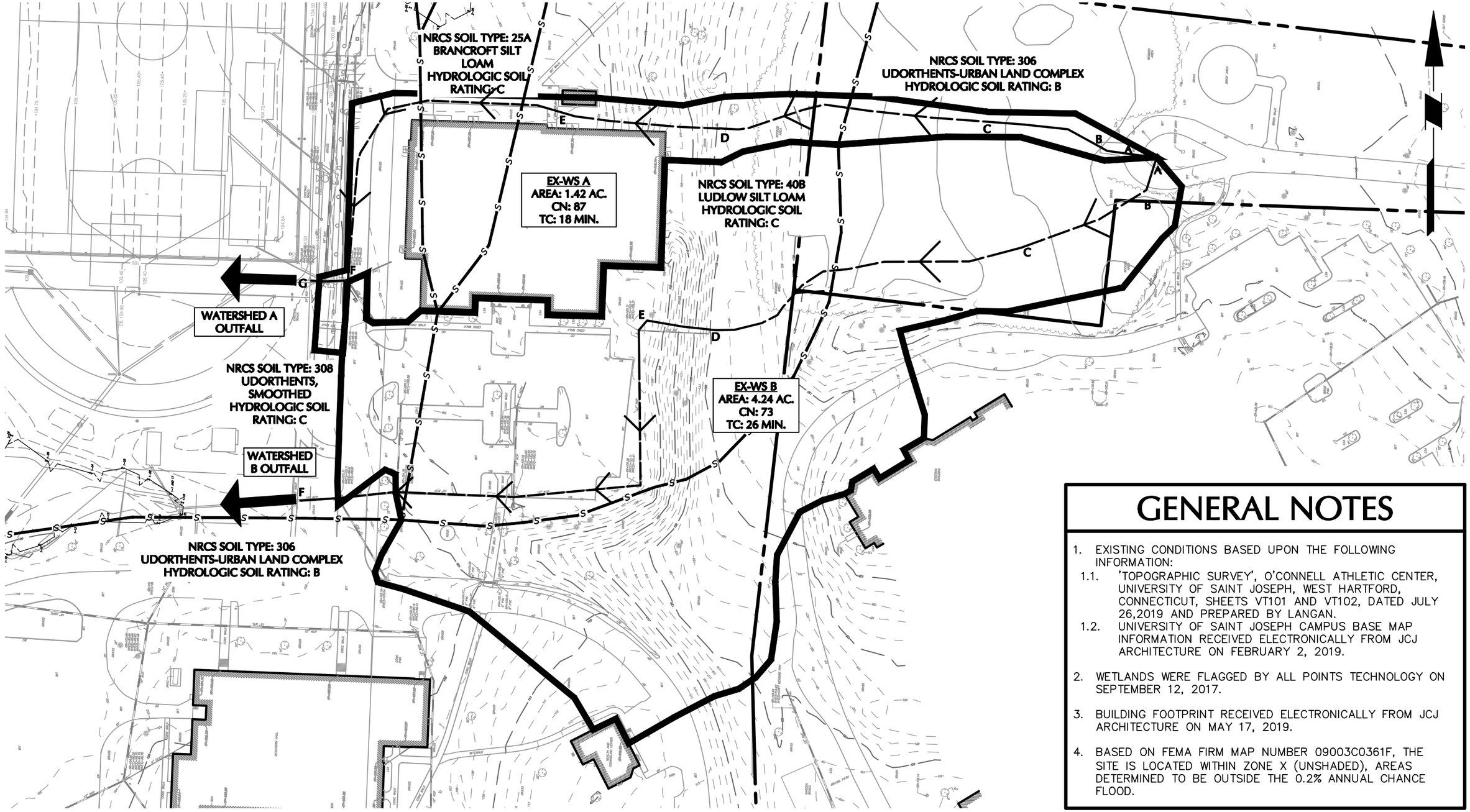


GENERAL NOTES

1. EXISTING CONDITIONS BASED UPON THE FOLLOWING INFORMATION:
   - 1.1. 'TOPOGRAPHIC SURVEY', O'CONNELL ATHLETIC CENTER, UNIVERSITY OF SAINT JOSEPH, WEST HARTFORD, CONNECTICUT, SHEETS VT101 AND VT102, DATED JULY 26,2019 AND PREPARED BY LANGAN.
   - 1.2. UNIVERSITY OF SAINT JOSEPH CAMPUS BASE MAP INFORMATION RECEIVED ELECTRONICALLY FROM JCJ ARCHITECTURE ON FEBRUARY 2, 2019.
2. WETLANDS WERE FLAGGED BY ALL POINTS TECHNOLOGY ON SEPTEMBER 12, 2017.
3. BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM JCJ ARCHITECTURE ON MAY 17, 2019.
4. BASED ON FEMA FIRM MAP NUMBER 09003C0361F, THE SITE IS LOCATED WITHIN ZONE X (UNSHADED), AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD.

80 0 40 80
SCALE: 1 INCH = 80 FEET

LANGAN
Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

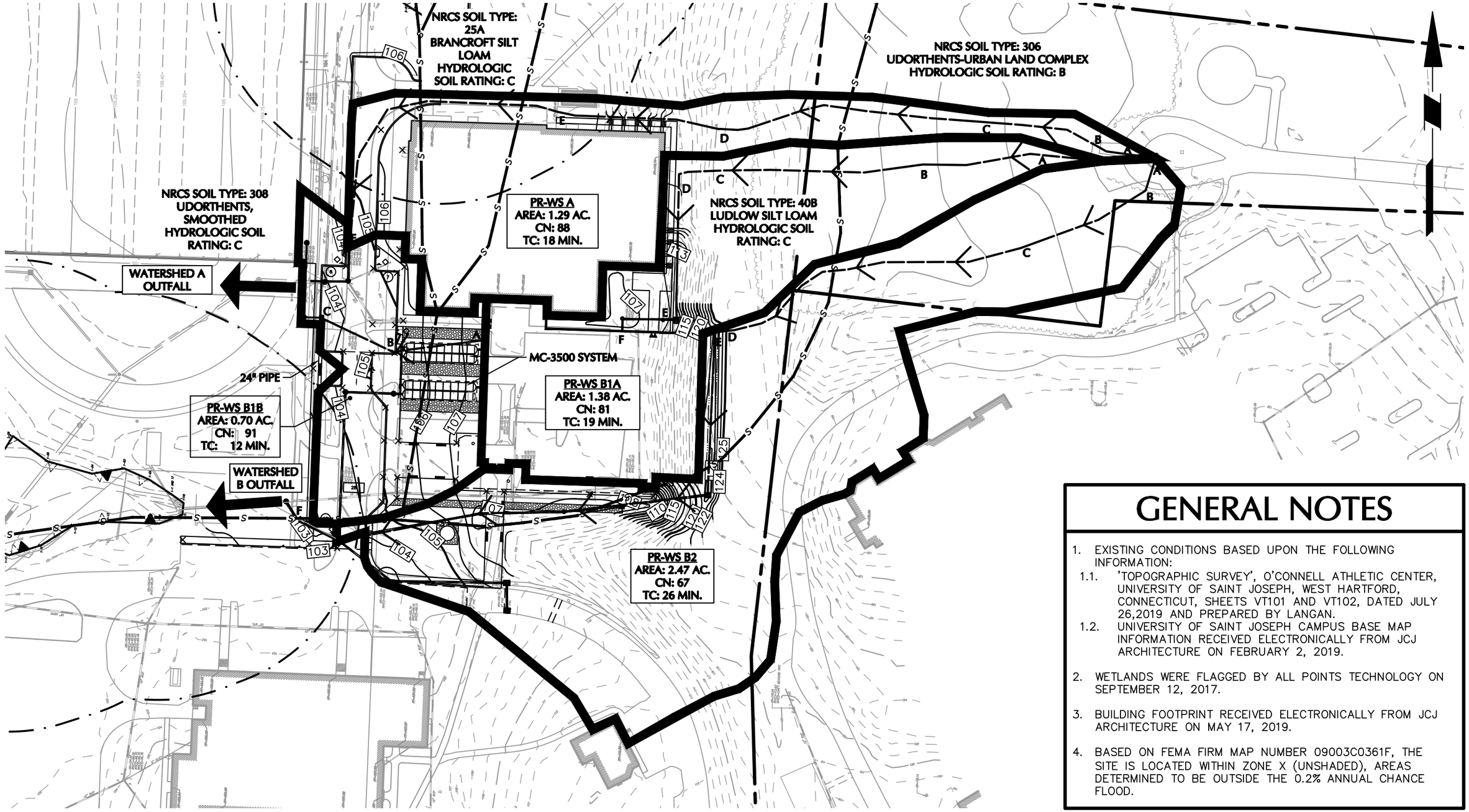
Project
O'CONNELL ATHLETIC CENTER ADDITION
WEST HARTFORD
HARTFORD COUNTY CONNECTICUT

Drawing Title
EXISTING WATERSHED MAP

Project No.	140202901
Date	JULY 26, 2019
Drawn By	KMS
Checked By	KEG

Drawing No. EXWS
Sheet 1 of 3

Filename: \\langan.com\data\NHV\data9\140202901\Project Data\CAD\01\SheetFiles\Stormwater\140202901-CG103-0101.dwg Date: 7/26/2019 Time: 09:21 User: kkromish Style Table: Langan.stb Layout: EXWS



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80 0 40 80
SCALE: 1 INCH = 80 FEET

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Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project
O'CONNELL ATHLETIC CENTER ADDITION
WEST HARTFORD
HARTFORD COUNTY CONNECTICUT

Drawing Title
PROPOSED WATERSHED MAP

Project No. 140202901	Drawing No. PRWS
Date JULY 26, 2019	
Drawn By KMS	
Checked By KEG	Sheet 2 of 3

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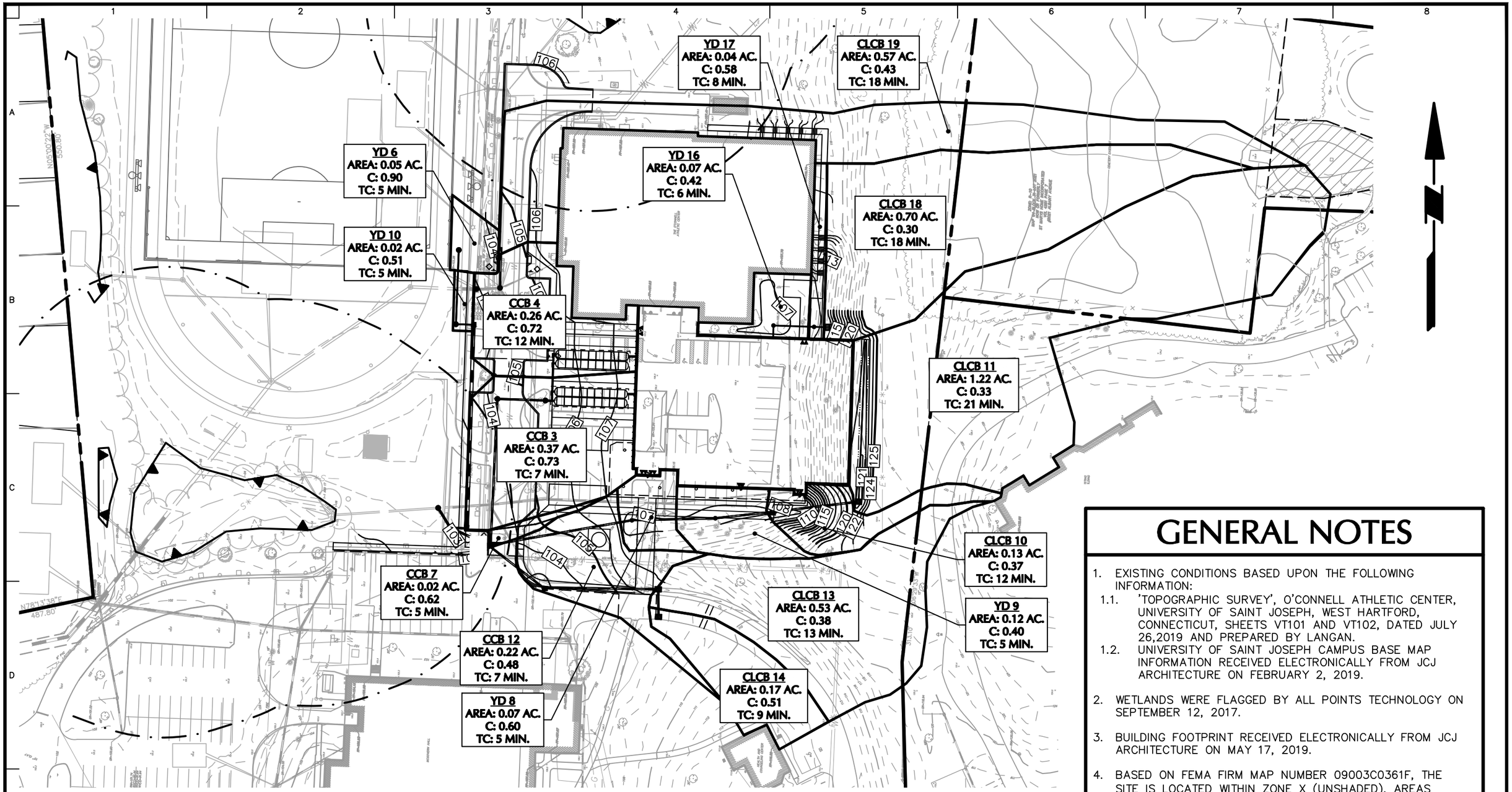

GENERAL NOTES

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LANGAN
Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project
O'CONNELL ATHLETIC CENTER ADDITION
WEST HARTFORD
HARTFORD COUNTY CONNECTICUT

Drawing Title
DRAINAGE AREA CATCHMENT MAP

Project No.	140202901
Date	JULY 26, 2019
Drawn By	AG
Checked By	KEG

Drawing No. DACB
Sheet 3 of 3

Filename: \\langan.com\data\NHV\data9\140202901\Project Data\CAD\01\SheetFiles\Stormwater\140202901-CG104-0102.dwg Date: 7/26/2019 Time: 09:12 User: kkromish Style Table: Langan.stb Layout: ANSIB-BL

APPENDIX A

Existing Stormwater Discharge Calculations

Project **USJ O'CONNELL ATHLETIC CENTER** By **KMS** Date **7/26/2019**

Location **WEST HARTFORD, CT** Checked **KEG** Date **7/26/2019**

Circle one: (Present) Developed **EX-WS A**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi² [ ] %	Product of CN x area
C	**Impervious**	**98**			**0.88**	**86.06**
C	**Open Space, Good Cond.**	**74**			**0.32**	**23.39**
C	**Woods, Good Condition**	**70**			**0.07**	**5.05**
B	**Open Space, Good Cond.**	**61**			**0.15**	**9.08**
1 Use only one CN source per line				Totals =	**1.42**	**123.59**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{123.59}{1.42} =$ 87.32 Use CN = **87**

2. Runoff

		Storm 1	Storm 2	Storm 3
Frequency	yr			
Rainfall, P (24-hour)	in			
S				
Runoff, Q	in			

(Use P and CN with Table 2-1, Fig. 2-1,

Project **USJ O'CONNELL ATHLETIC CENTER** By **KMS** Date **7/26/2019**

Location **WEST HARTFORD, CT** Checked **KEG** Date **7/26/2019**

Circle one: (Present) Developed **EX-WS B**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
C	**Impervious**	**98**			**1.00**	**98.19**
C	**Open Space, Good Cond.**	**74**			**0.93**	**68.95**
C	**Woods, Good Condition**	**70**			**0.22**	**15.42**
B	**Open Space, Good Cond.**	**61**			**1.69**	**103.27**
B	**Woods, Good Condition**	**55**			**0.39**	**21.55**
1 Use only one CN source per line				Totals =	**4.24**	**307.37**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{307.37}{4.24} =$ 72.52 Use CN = **73**

2. Runoff

		Storm 1	Storm 2	Storm 3
Frequency	yr			
Rainfall, P (24-hour)	in			
S				
Runoff, Q	in			

(Use P and CN with Table 2-1, Fig. 2-1,

Project **O'Connell Athletic Center Expansion** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle One: (Present) Developed

Circle One: (T_c) T_t through subarea **EX-WS A**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB	BC				
1. Surface description (table 3-1)			Smooth Surface	Dense Grasses				
2. Manning's roughness coeff., n (table 3-1)			0.01	0.24				
3. Flow Length, L (total L ≤ 300 ft)		ft	40	110				
4. Two-yr 24-hr rainfall, P_2		in	3.3	3.3				
5. Land slope, s		ft/ft	0.020	0.025				
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.010	+ 0.231	+	=	0.241	

Shallow concentrated flow		Segment ID	CD	DE	EF			
7. Surface description (paved or unpaved)			Unpaved	Unpaved	Paved			
8. Flow length, L		ft	230	140	300			
9. Watercourse slope, s		ft/ft	0.030	0.300	0.020			
10. Average velocity, V (figure 3-1)		ft/s	2.8	8.8	2.9			
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.023	+ 0.004	+ 0.029	=	0.056	

Channel flow		Segment ID	FG					
12. Cross sectional flow area, a		ft^2						
13. Wetted perimeter, p_w		ft						
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft						
15. Channel slope, s		ft/ft						
16. Manning's roughness coeff., n								
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00					
18. Flow length, L		ft	30					
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.002	+	=	0.002		

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19) 0.299 hr

Use Tc= 18 min

Project **O'Connell Athletic Center Expansion** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle One: (Present) Developed

Circle One: (T_c) T_t through subarea **EX-WS B**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

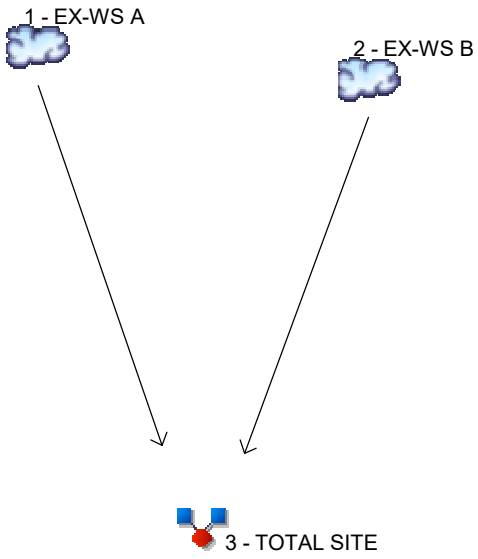
Sheet flow (Applicable to T_c Only)		Segment ID	AB	BC			
1. Surface description (table 3-1)			Smooth Surface	Light Underbrush			
2. Manning's roughness coeff., n (table 3-1)			0.01	0.40			
3. Flow Length, L (total L ≤ 300 ft)		ft	30	120			
4. Two-yr 24-hr rainfall, P_2		in	3.3	3.3			
5. Land slope, s		ft/ft	0.020	0.025			
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.008	+ 0.373	+	=	0.381

Shallow concentrated flow		Segment ID	CD	DE			
7. Surface description (paved or unpaved)			Unpaved	Unpaved			
8. Flow length, L		ft	285	65			
9. Watercourse slope, s		ft/ft	0.030	0.300			
10. Average velocity, V (figure 3-1)		ft/s	2.8	8.8			
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.028	+ 0.002		=	0.030

Channel flow		Segment ID	EF				
12. Cross sectional flow area, a		ft^2					
13. Wetted perimeter, p_w		ft					
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft					
15. Channel slope, s		ft/ft					
16. Manning's roughness coeff., n							
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00				
18. Flow length, L		ft	420				
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.023	+		=	0.023
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)							0.434 hr

Use Tc= 26 min

Watershed Model Schematic



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

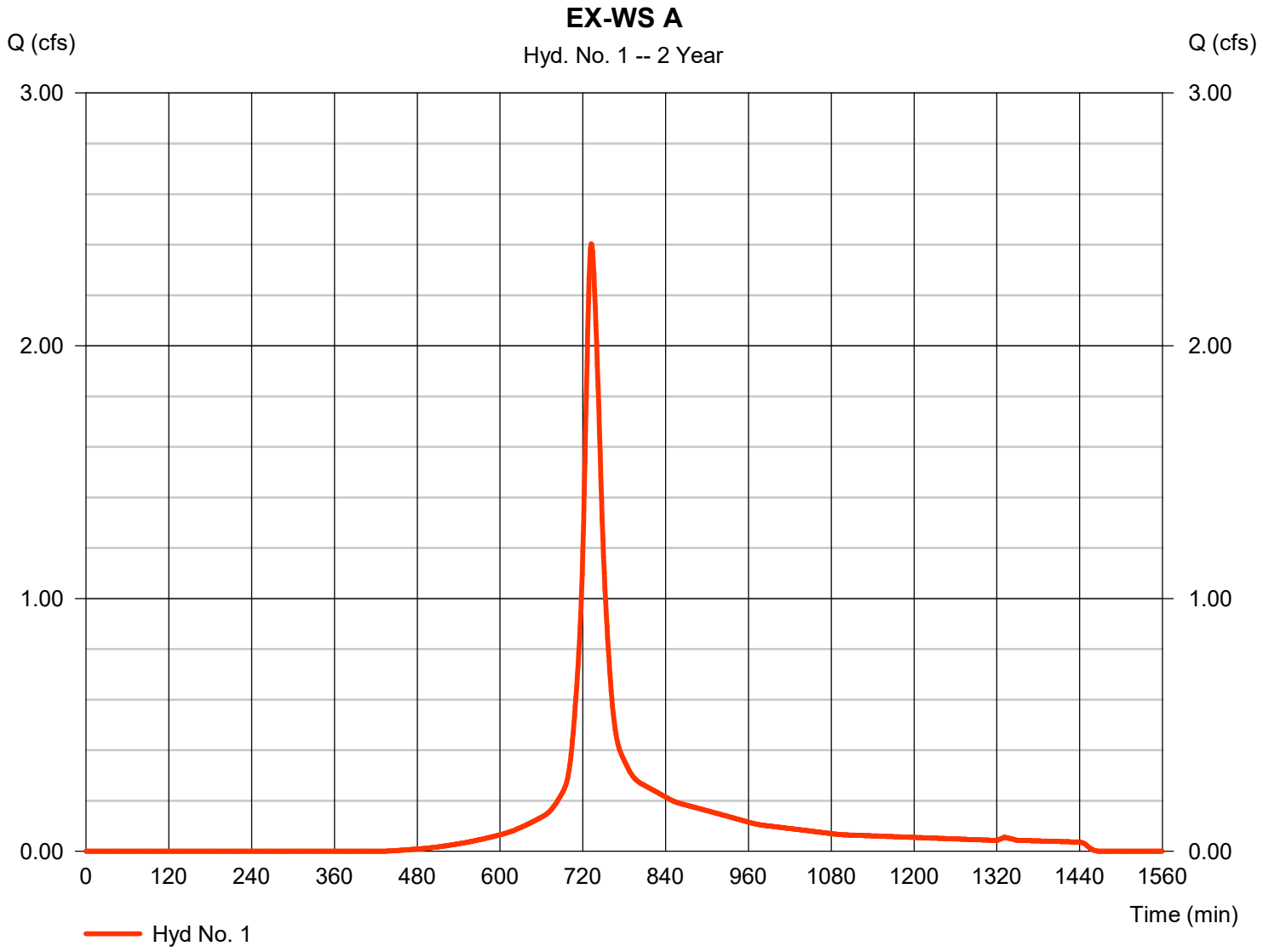
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.404	1	732	10,210	------	------	------	EX-WS A
2	SCS Runoff	3.066	1	741	16,245	------	------	------	EX-WS B
3	Combine	5.200	1	737	26,456	1, 2	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

EX-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.404 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	10,210 cuft
Drainage area	=	1.420 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

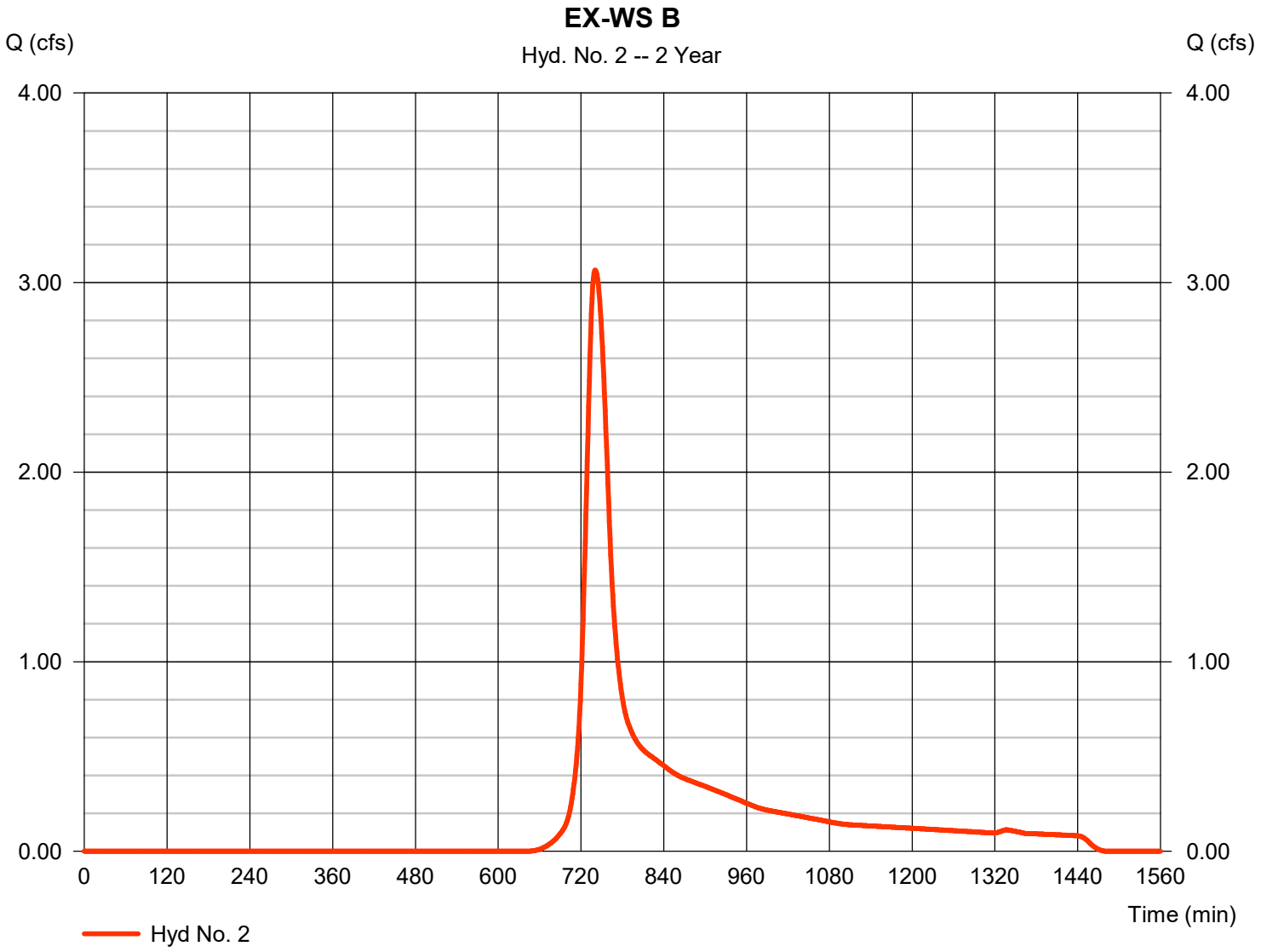


Hydrograph Report

Hyd. No. 2

EX-WS B

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.066 cfs
Storm frequency	=	2 yrs	Time to peak	=	741 min
Time interval	=	1 min	Hyd. volume	=	16,245 cuft
Drainage area	=	4.240 ac	Curve number	=	73
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

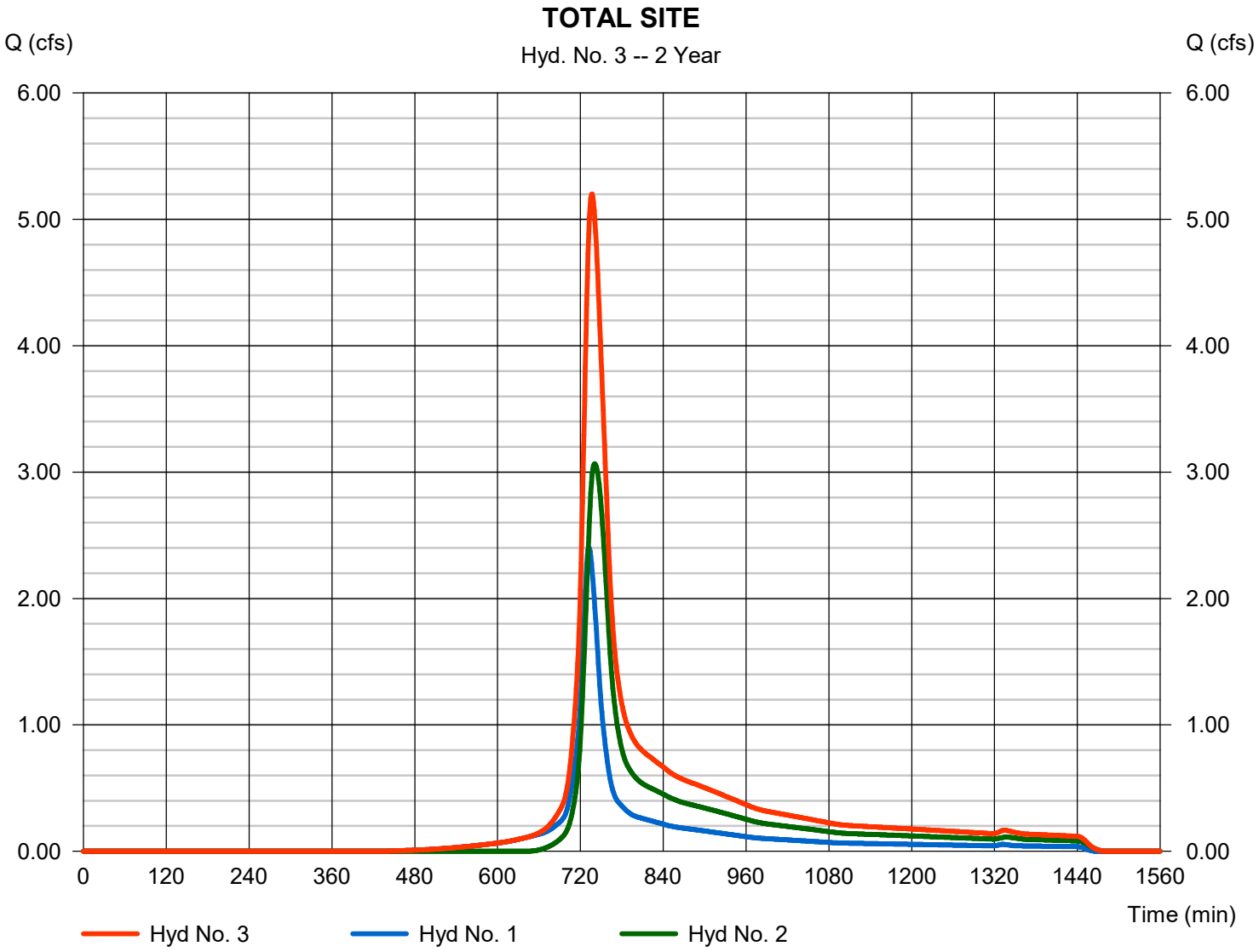


Hydrograph Report

Hyd. No. 3

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 5.200 cfs
Storm frequency	= 2 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 26,456 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.660 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

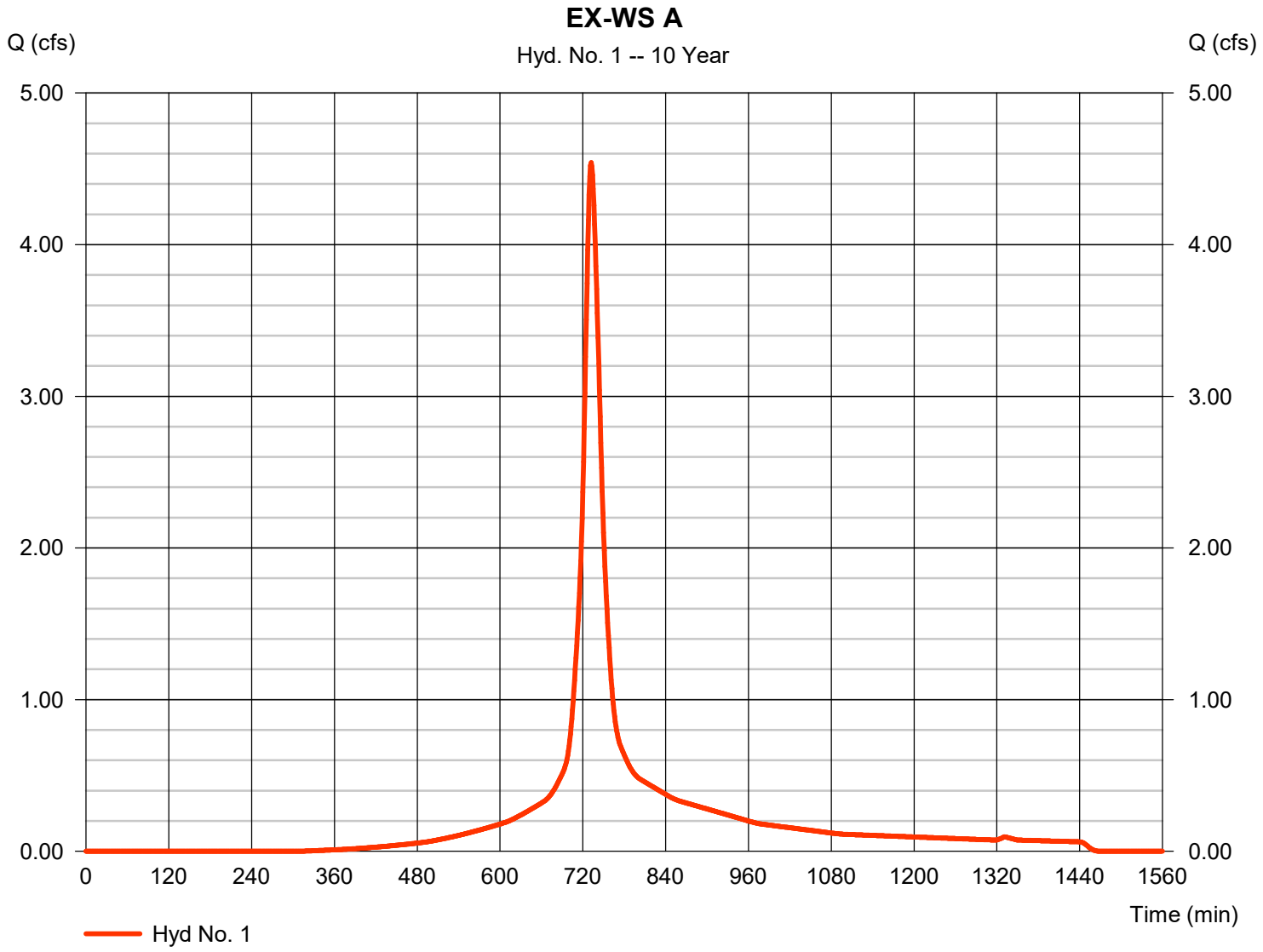
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.541	1	732	19,623	------	------	------	EX-WS A
2	SCS Runoff	7.789	1	739	39,058	------	------	------	EX-WS B
3	Combine	11.88	1	736	58,681	1, 2	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

EX-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.541 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	19,623 cuft
Drainage area	=	1.420 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

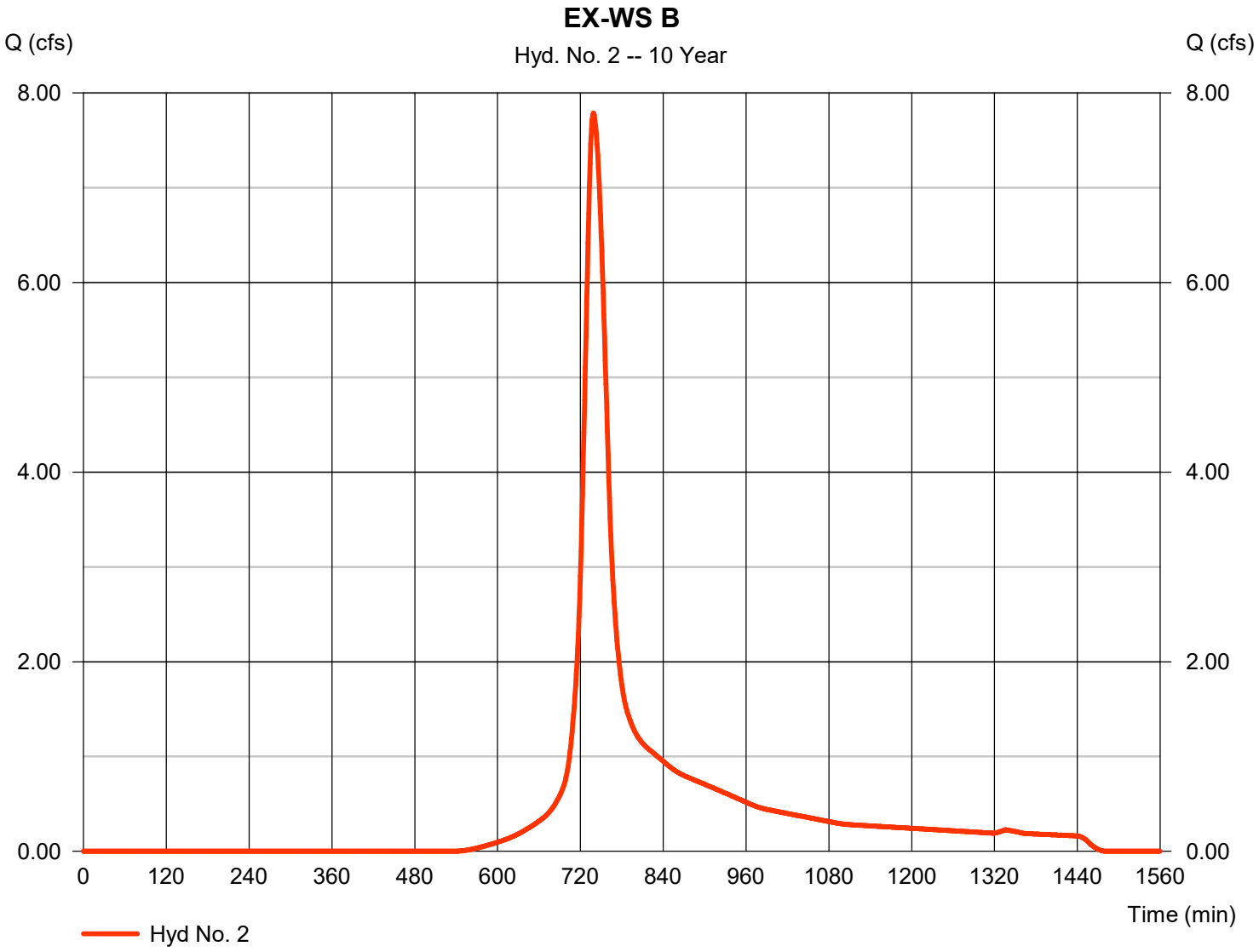


Hydrograph Report

Hyd. No. 2

EX-WS B

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.789 cfs
Storm frequency	=	10 yrs	Time to peak	=	739 min
Time interval	=	1 min	Hyd. volume	=	39,058 cuft
Drainage area	=	4.240 ac	Curve number	=	73
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

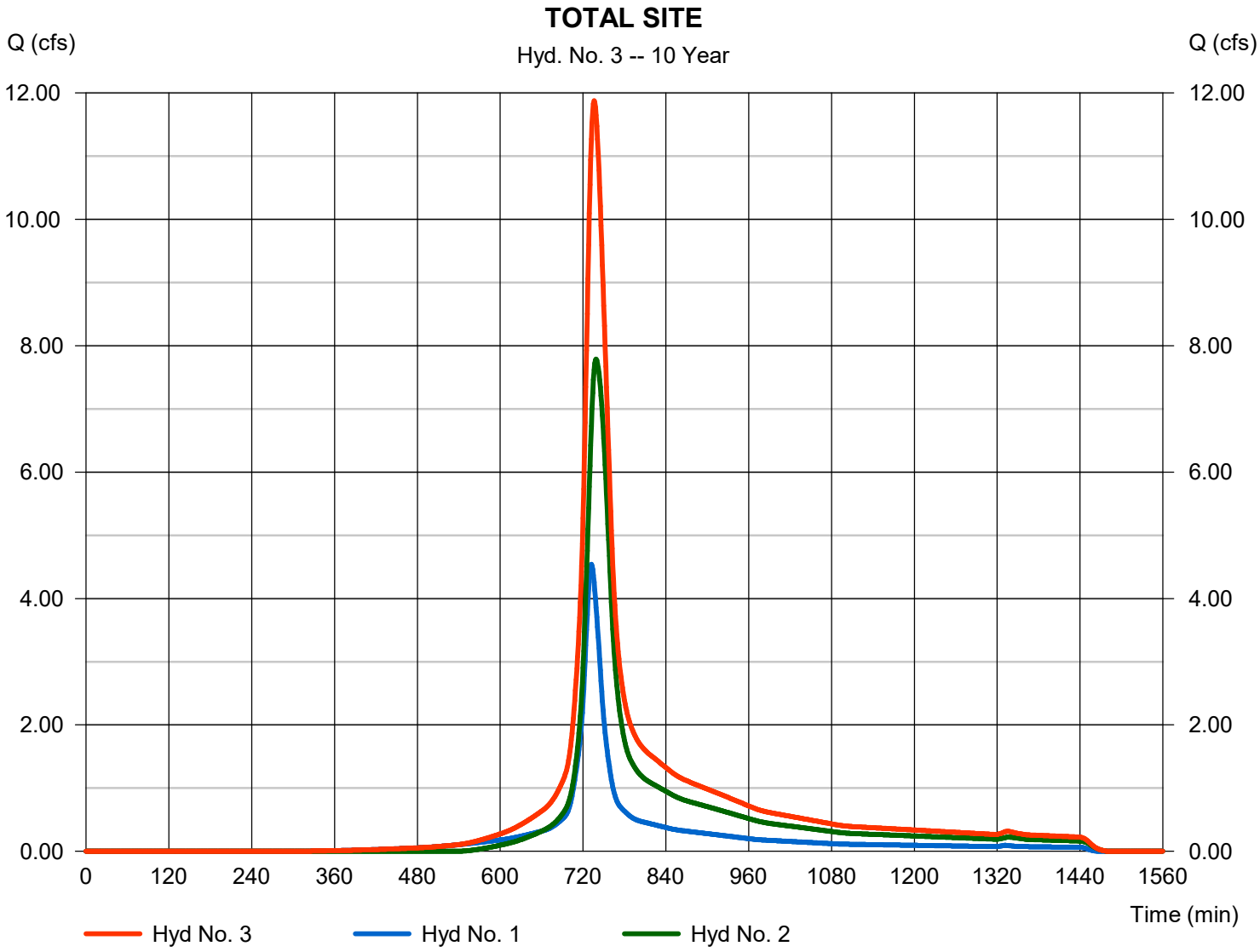


Hydrograph Report

Hyd. No. 3

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 11.88 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 58,681 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.660 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

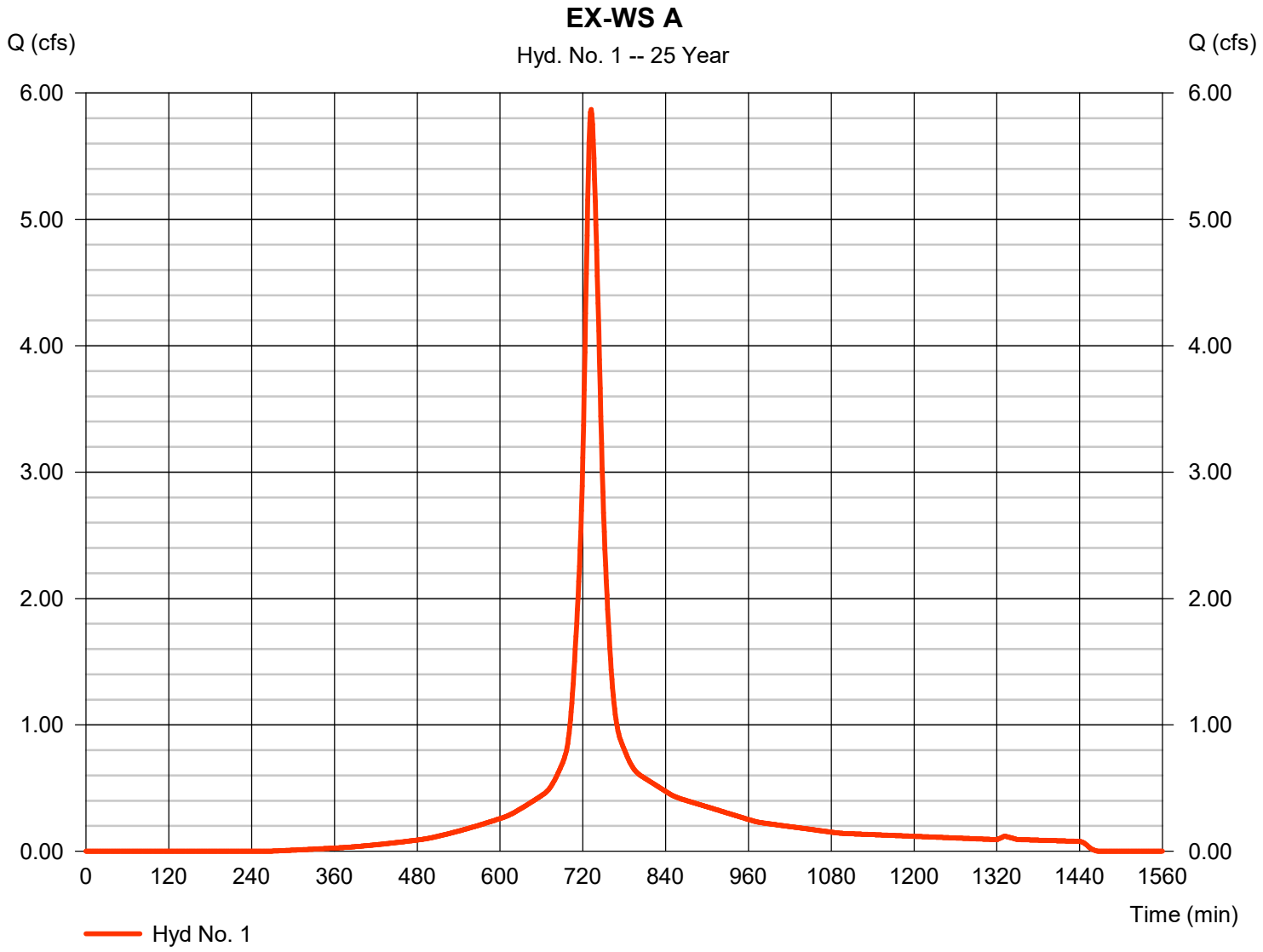
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	5.869	1	732	25,661	------	------	------	EX-WS A
2	SCS Runoff	11.02	1	738	54,938	------	------	------	EX-WS B
3	Combine	16.32	1	736	80,600	1, 2	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

EX-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.869 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	25,661 cuft
Drainage area	=	1.420 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	6.54 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

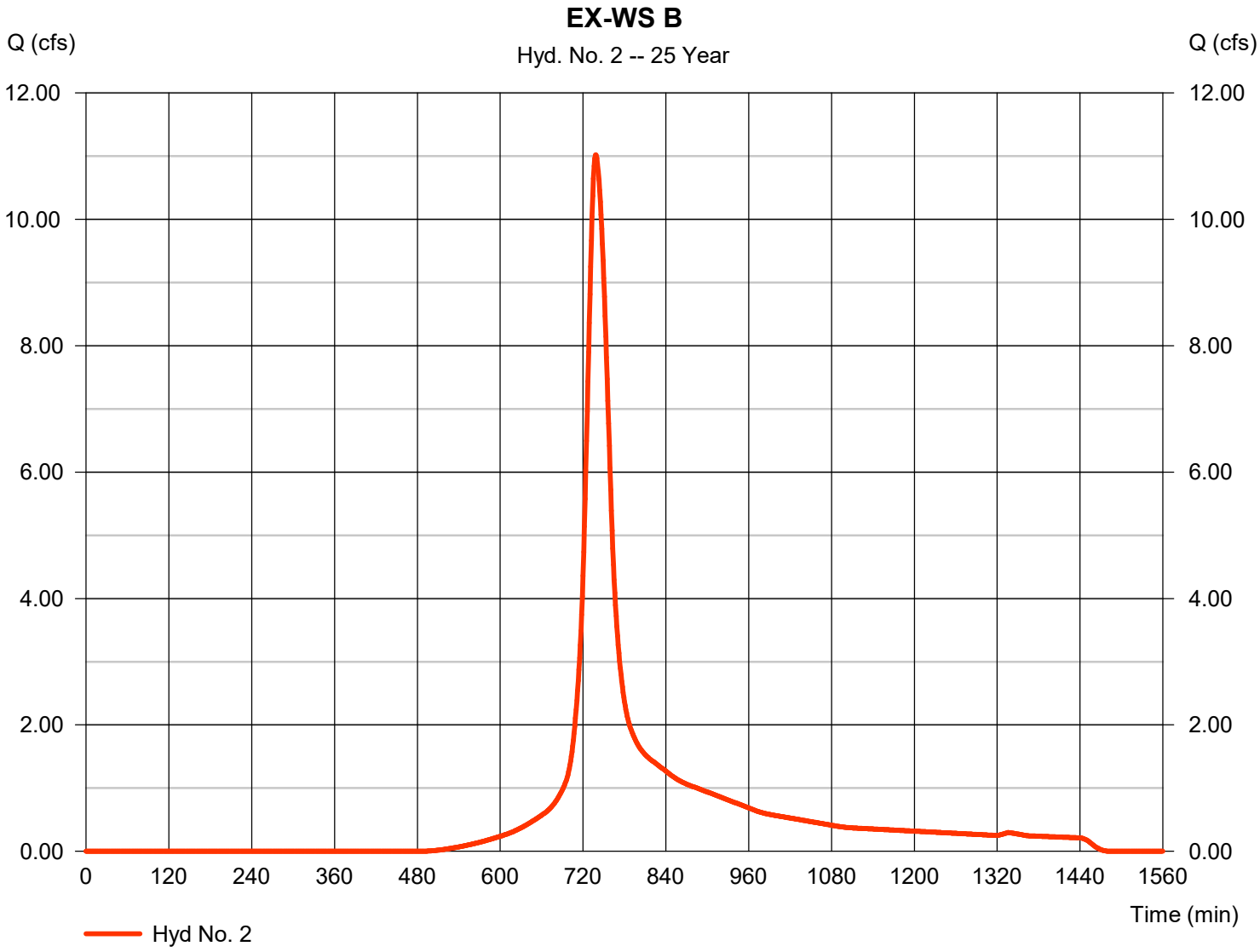


Hydrograph Report

Hyd. No. 2

EX-WS B

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.02 cfs
Storm frequency	=	25 yrs	Time to peak	=	738 min
Time interval	=	1 min	Hyd. volume	=	54,938 cuft
Drainage area	=	4.240 ac	Curve number	=	73
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	6.54 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

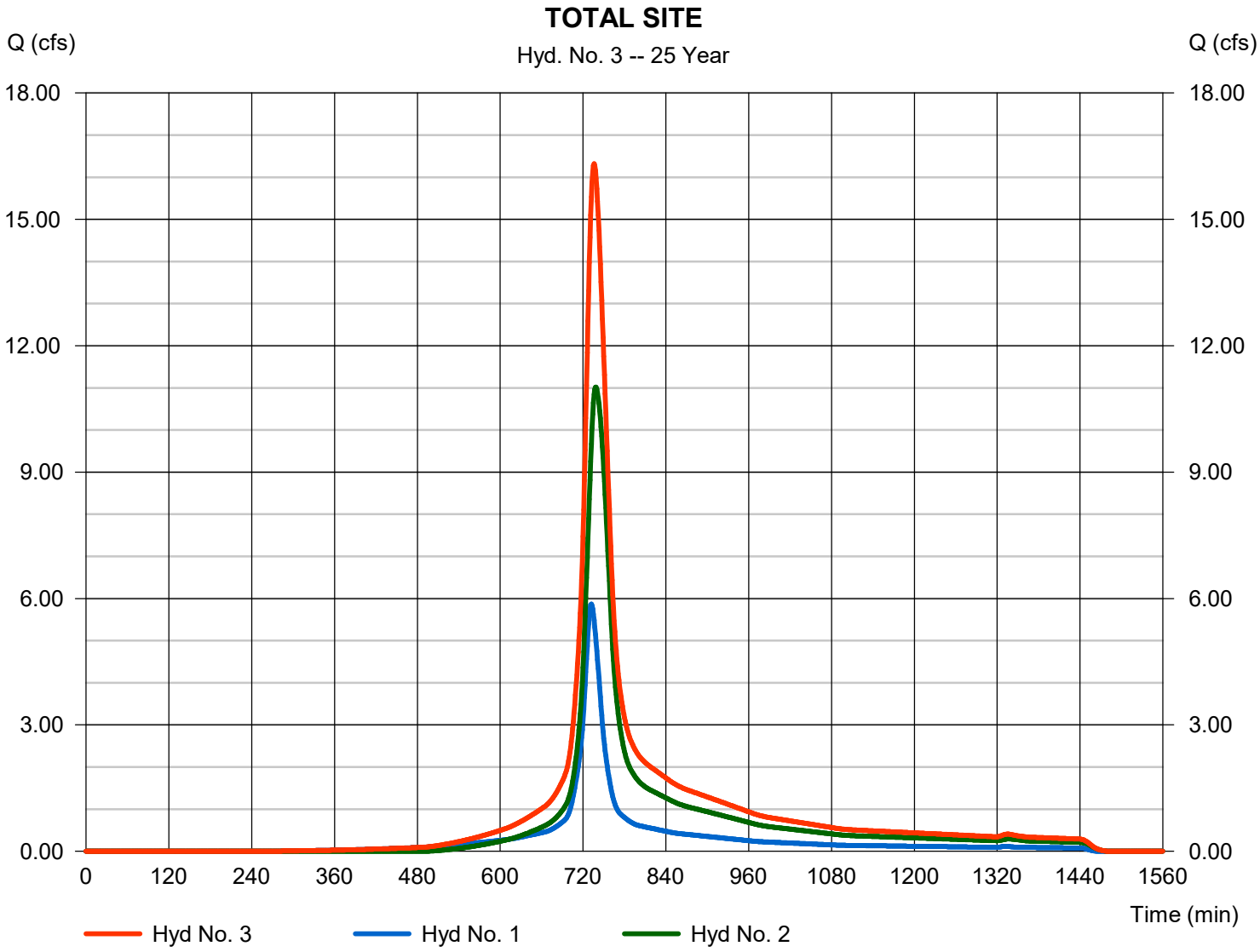


Hydrograph Report

Hyd. No. 3

TOTAL SITE

Hydrograph type	=	Combine	Peak discharge	=	16.32 cfs
Storm frequency	=	25 yrs	Time to peak	=	736 min
Time interval	=	1 min	Hyd. volume	=	80,600 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	5.660 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

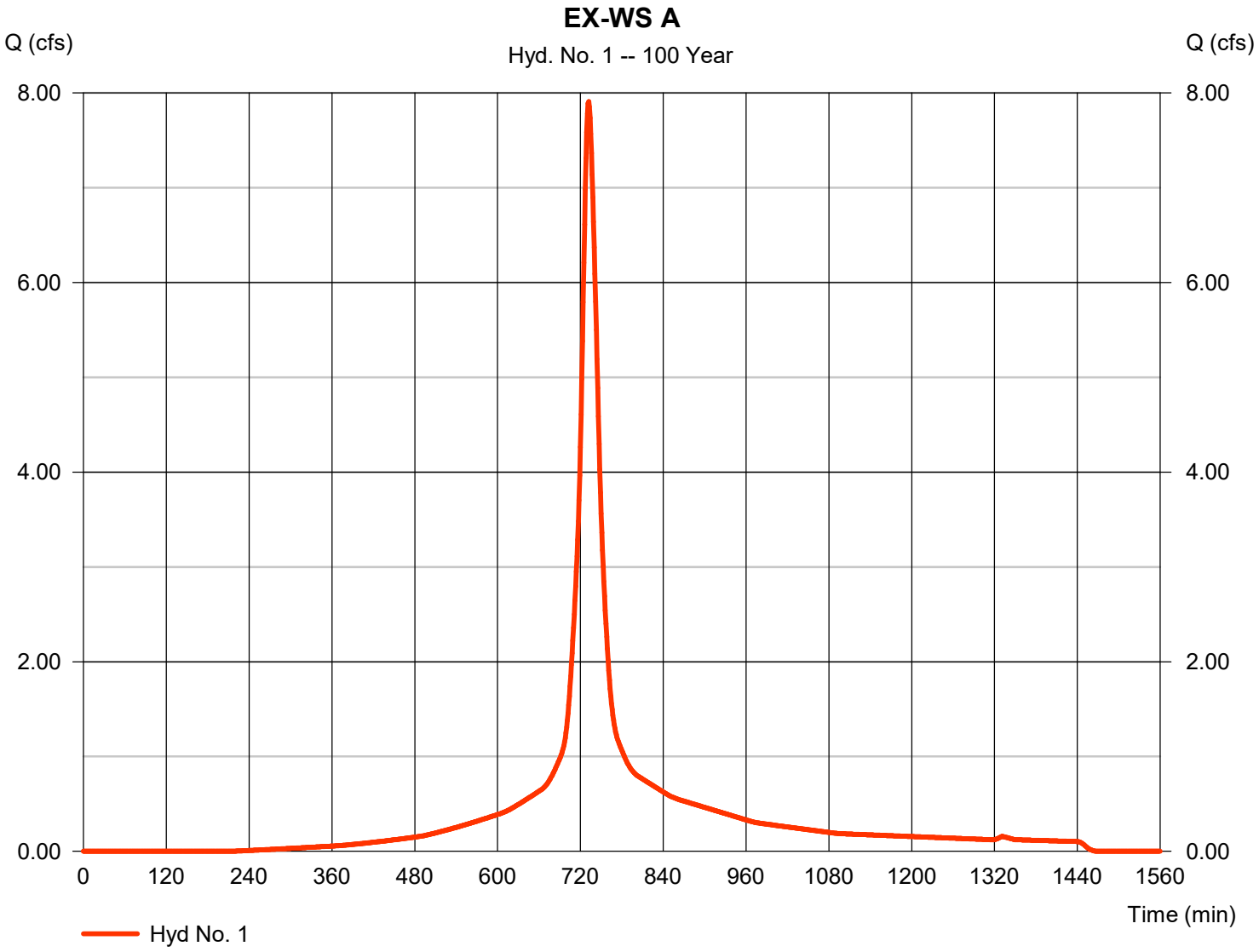
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.911	1	732	35,153	------	------	------	EX-WS A
2	SCS Runoff	16.24	1	738	80,964	------	------	------	EX-WS B
3	Combine	23.40	1	736	116,117	1, 2	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

EX-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.911 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	35,153 cuft
Drainage area	=	1.420 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	8.46 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

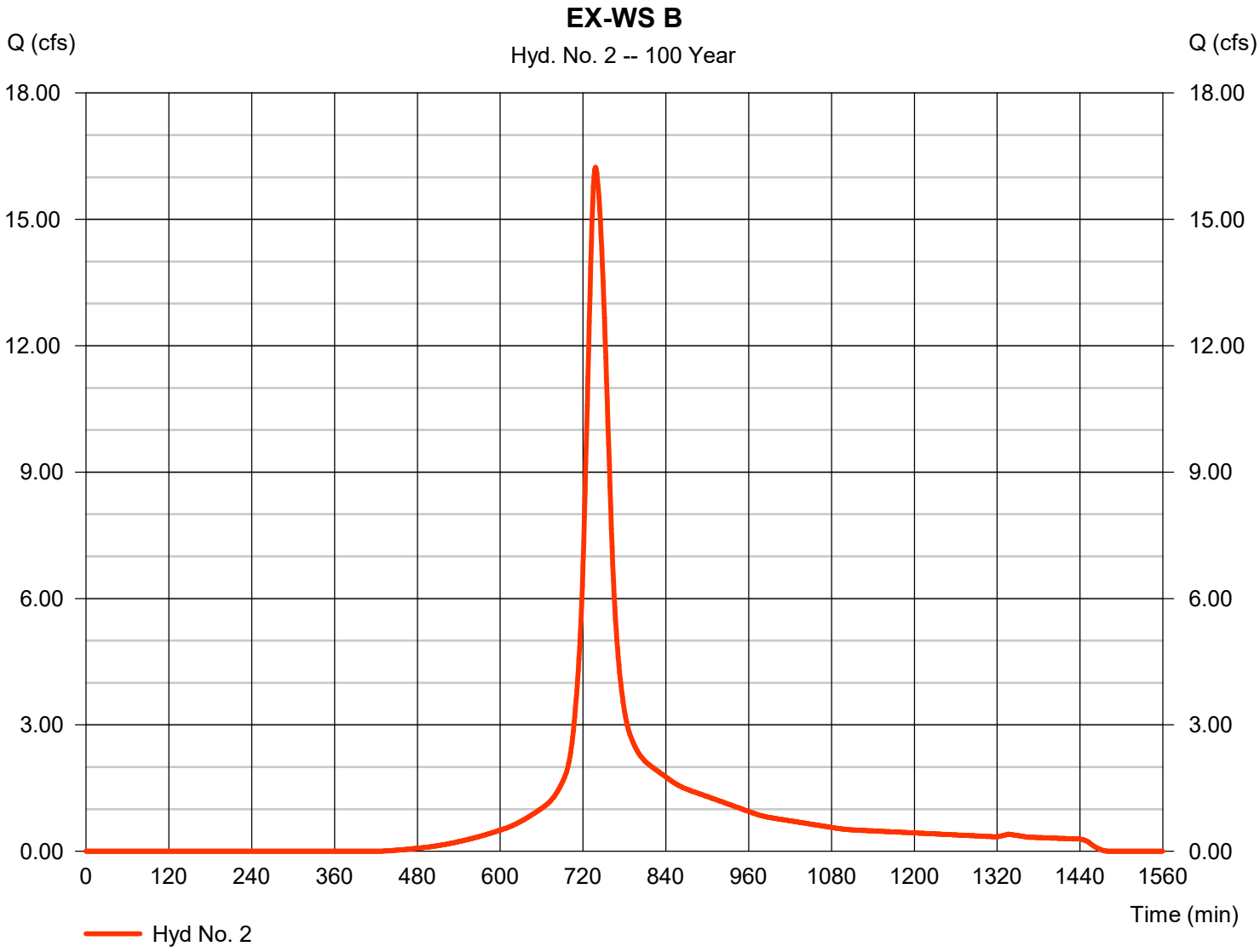


Hydrograph Report

Hyd. No. 2

EX-WS B

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.24 cfs
Storm frequency	=	100 yrs	Time to peak	=	738 min
Time interval	=	1 min	Hyd. volume	=	80,964 cuft
Drainage area	=	4.240 ac	Curve number	=	73
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	8.46 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

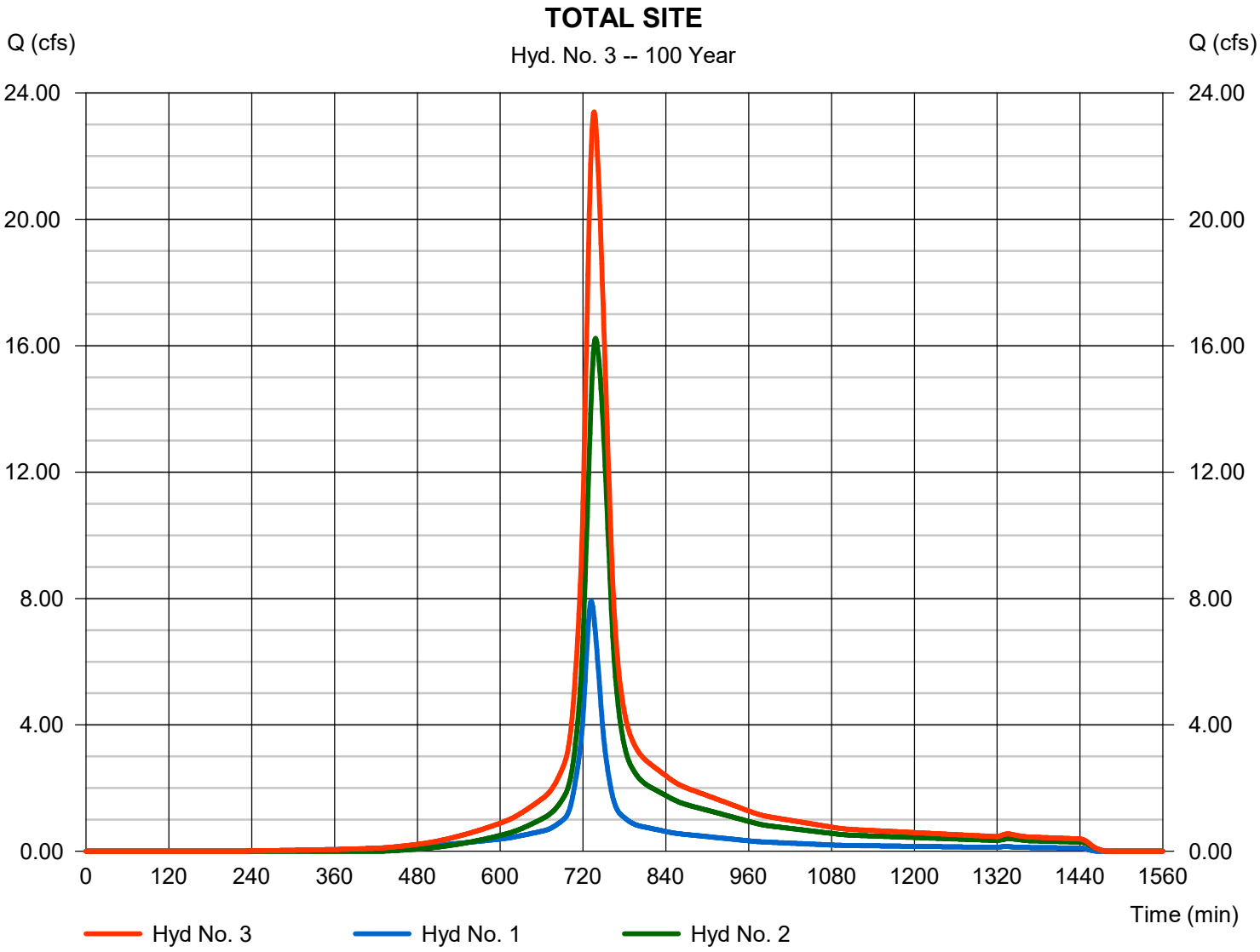


Hydrograph Report

Hyd. No. 3

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 23.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 116,117 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.660 ac



APPENDIX B

Proposed Stormwater Discharge Calculations

Project **USJ O'CONNELL ATHLETIC CENTER** By **KMS** Date **7/26/2019**

Location **WEST HARTFORD, CT** Checked **KEG** Date **7/26/2019**

Circle one: Present (Developed) **PR-WS A**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
C	**Impervious**	**98**			**0.86**	**84.44**
C	**Open Space, Good Cond.**	**74**			**0.21**	**15.43**
C	**Woods, Good Condition**	**70**			**0.07**	**5.05**
B	**Open Space, Good Cond.**	**61**			**0.15**	**9.08**
1 Use only one CN source per line				Totals =	**1.29**	**114.00**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{114.00}{1.29} =$ 88.29 Use CN = **88**

2. Runoff

		Storm 1	Storm 2	Storm 3
Frequency	yr			
Rainfall, P (24-hour)	in			
S				
Runoff, Q	in			

(Use P and CN with Table 2-1, Fig. 2-1,

Project **USJ O'CONNELL ATHLETIC CENTER** By **KMS** Date **7/26/2019**

Location **WEST HARTFORD, CT** Checked **KEG** Date **7/26/2019**

Circle one: Present (Developed) **PR-WS B1A (MC 3500)**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
C	**Impervious**	**98**			**0.61**	**60.14**
C	**Open Space, Good Cond.**	**74**			**0.30**	**22.26**
C	**Woods, Good Condition**	**70**			**0.19**	**13.21**
B	**Open Space, Good Cond.**	**61**			**0.26**	**15.76**
B	**Woods, Good Condition**	**55**			**0.02**	**0.86**
1 Use only one CN source per line				Totals =	**1.38**	**112.24**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{112.24}{1.38} =$ 81.49 Use CN = **81**

2. Runoff

		Storm 1	Storm 2	Storm 3
Frequency	yr			
Rainfall, P (24-hour)	in			
S				
Runoff, Q	in			

(Use P and CN with Table 2-1, Fig. 2-1,

Project **USJ O'CONNELL ATHLETIC CENTER** By **KMS** Date **7/26/2019**

Location **WEST HARTFORD, CT** Checked **KEG** Date **7/26/2019**

Circle one: Present (Developed) **PR-WS B1B (24" PIPE)**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
C	**Impervious**	**98**			**0.48**	**47.26**
C	**Open Space, Good Cond.**	**74**			**0.22**	**15.95**
1 Use only one CN source per line				Totals =	**0.70**	**63.21**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{63.21}{0.70} =$ 90.59 Use CN = **91**

2. Runoff

		Storm 1	Storm 2	Storm 3
Frequency	yr			
Rainfall, P (24-hour)	in			
S				
Runoff, Q	in			

(Use P and CN with Table 2-1, Fig. 2-1,

Project **USJ O'CONNELL ATHLETIC CENTER** By **KMS** Date **7/26/2019**

Location **WEST HARTFORD, CT** Checked **KEG** Date **7/26/2019**

Circle one: Present (Developed) **PR-WS B2**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
C	**Impervious**	**98**			**0.37**	**35.88**
C	**Open Space, Good Cond.**	**74**			**0.27**	**19.71**
C	**Woods, Good Condition**	**70**			**0.03**	**2.20**
B	**Open Space, Good Cond.**	**61**			**1.43**	**87.14**
B	**Woods, Good Condition**	**55**			**0.37**	**20.61**
1 Use only one CN source per line				Totals =	**2.47**	**165.53**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{165.53}{2.47} =$ 67.10 Use CN = **67**

2. Runoff

		Storm 1	Storm 2	Storm 3
Frequency	yr			
Rainfall, P (24-hour)	in			
S				
Runoff, Q	in			

(Use P and CN with Table 2-1, Fig. 2-1,

Project **O'Connell Athletic Center Expansion** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-WS A**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB	BC				
1. Surface description (table 3-1)			Smooth Surface	Dense Grasses				
2. Manning's roughness coeff., n (table 3-1)			0.01	0.24				
3. Flow Length, L (total L ≤ 300 ft)		ft	40	110				
4. Two-yr 24-hr rainfall, P_2		in	3.3	3.3				
5. Land slope, s		ft/ft	0.020	0.025				
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.010	+ 0.231	+	=	0.241	

Shallow concentrated flow		Segment ID	CD	DE	EF		
7. Surface description (paved or unpaved)			Unpaved	Unpaved	Paved		
8. Flow length, L		ft	230	140	270		
9. Watercourse slope, s		ft/ft	0.030	0.300	0.020		
10. Average velocity, V (figure 3-1)		ft/s	2.8	8.8	2.9		
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.023	+ 0.004	+ 0.026	=	0.053

Channel flow		Segment ID	FG			
12. Cross sectional flow area, a		ft^2				
13. Wetted perimeter, p_w		ft				
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft				
15. Channel slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. $V = \frac{1.49\ r^{2/3} s^{1/2}}{n}$	Compute V	ft/s	5.00			
18. Flow length, L		ft	65			
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.004	+	=	0.004
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						0.298 hr

Use Tc= 18 min

Project **O'Connell Athletic Center Expansion** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-WS B1A (MC-3500)**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB		
1. Surface description (table 3-1)			Dense Grasses		
2. Manning's roughness coeff., n (table 3-1)			0.24		
3. Flow Length, L (total L ≤ 300 ft)		ft	150		
4. Two-yr 24-hr rainfall, P_2		in	3.3		
5. Land slope, s		ft/ft	0.030		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.275 +	+	= 0.275

Shallow concentrated flow		Segment ID	BC	CD	
7. Surface description (paved or unpaved)			Unpaved	Unpaved	
8. Flow length, L		ft	290	25	
9. Watercourse slope, s		ft/ft	0.030	0.300	
10. Average velocity, V (figure 3-1)		ft/s	2.8	8.8	
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.029 +	0.001 =	0.030

Channel flow		Segment ID	DE		
12. Cross sectional flow area, a		ft^2			
13. Wetted perimeter, p_w		ft			
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft			
15. Channel slope, s		ft/ft			
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00		
18. Flow length, L		ft	65		
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.004 +	=	0.004

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19) **0.309** hr

Use Tc= 19 min

Project **O'Connell Athletic Center Expansion** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-WS B1B (24" PIPE)**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB	BC				
1. Surface description (table 3-1)			Dense Grasses	Smooth Surface				
2. Manning's roughness coeff., n (table 3-1)			0.24	0.01				
3. Flow Length, L (total L ≤ 300 ft)		ft	75	70				
4. Two-yr 24-hr rainfall, P_2		in	3.3	3.3				
5. Land slope, s		ft/ft	0.020	0.020				
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.186	+ 0.014	+	=	0.200	

Shallow concentrated flow		Segment ID				
7. Surface description (paved or unpaved)						
8. Flow length, L		ft				
9. Watercourse slope, s		ft/ft				
10. Average velocity, V (figure 3-1)		ft/s				
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr		+	=	0.000

Channel flow		Segment ID				
12. Cross sectional flow area, a		ft^2				
13. Wetted perimeter, p_w		ft				
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft				
15. Channel slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s				
18. Flow length, L		ft				
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr		+	=	0.000
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						0.200 hr

Use Tc= 12 min

Project **O'Connell Athletic Center Expansion** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-WS B2**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB	BC				
1. Surface description (table 3-1)			Smooth Surface	Light Underbrush				
2. Manning's roughness coeff., n (table 3-1)			0.01	0.40				
3. Flow Length, L (total L ≤ 300 ft)		ft	30	120				
4. Two-yr 24-hr rainfall, P_2		in	3.3	3.3				
5. Land slope, s		ft/ft	0.020	0.025				
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.008	+ 0.373	+	=	0.381	

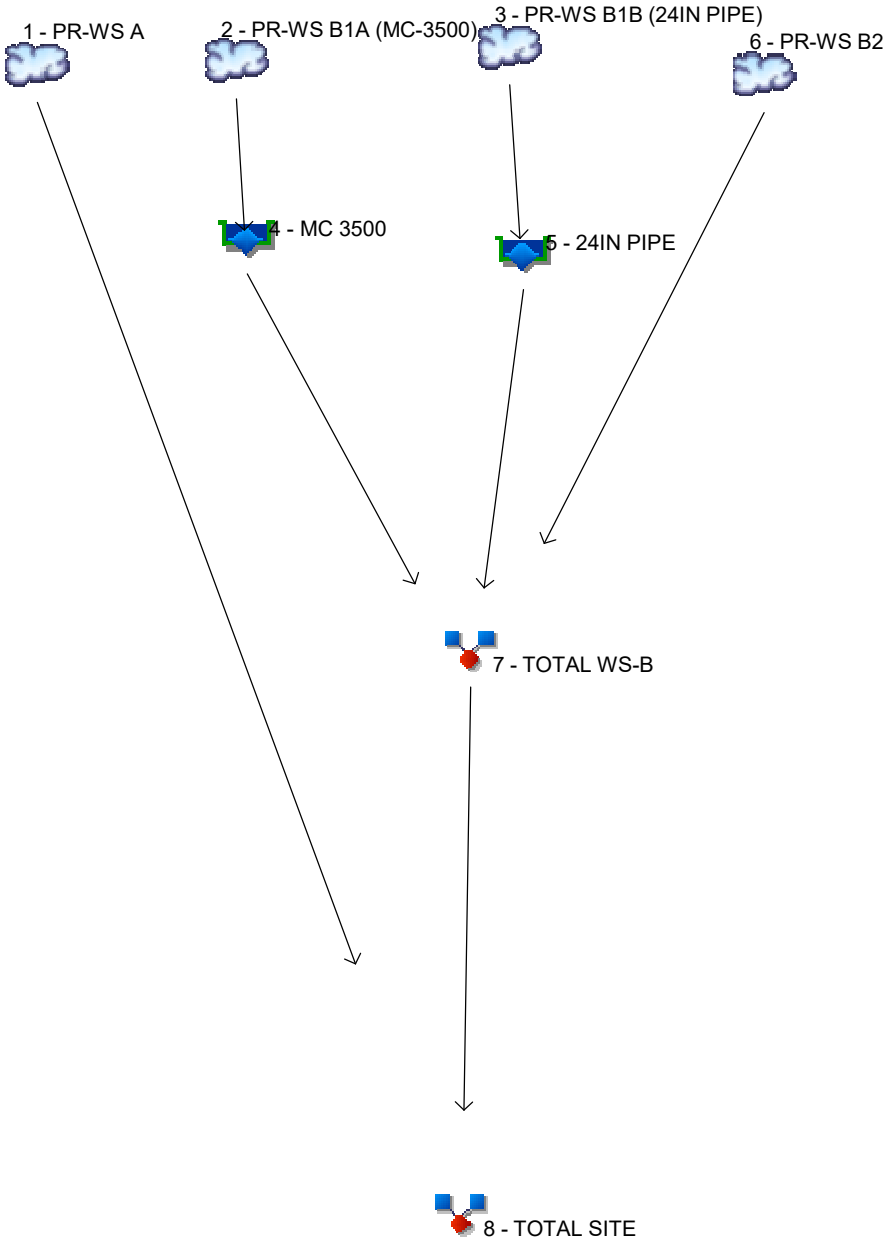
Shallow concentrated flow		Segment ID	CD	DE			
7. Surface description (paved or unpaved)			Unpaved	Unpaved			
8. Flow length, L		ft	270	10			
9. Watercourse slope, s		ft/ft	0.030	0.300			
10. Average velocity, V (figure 3-1)		ft/s	2.8	8.8			
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.027	+ 0.000	=	0.027	

Channel flow		Segment ID	EF			
12. Cross sectional flow area, a		ft^2				
13. Wetted perimeter, p_w		ft				
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft				
15. Channel slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00			
18. Flow length, L		ft	490			
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.027	+	=	0.027
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						0.435 hr

Use Tc= 26 min

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

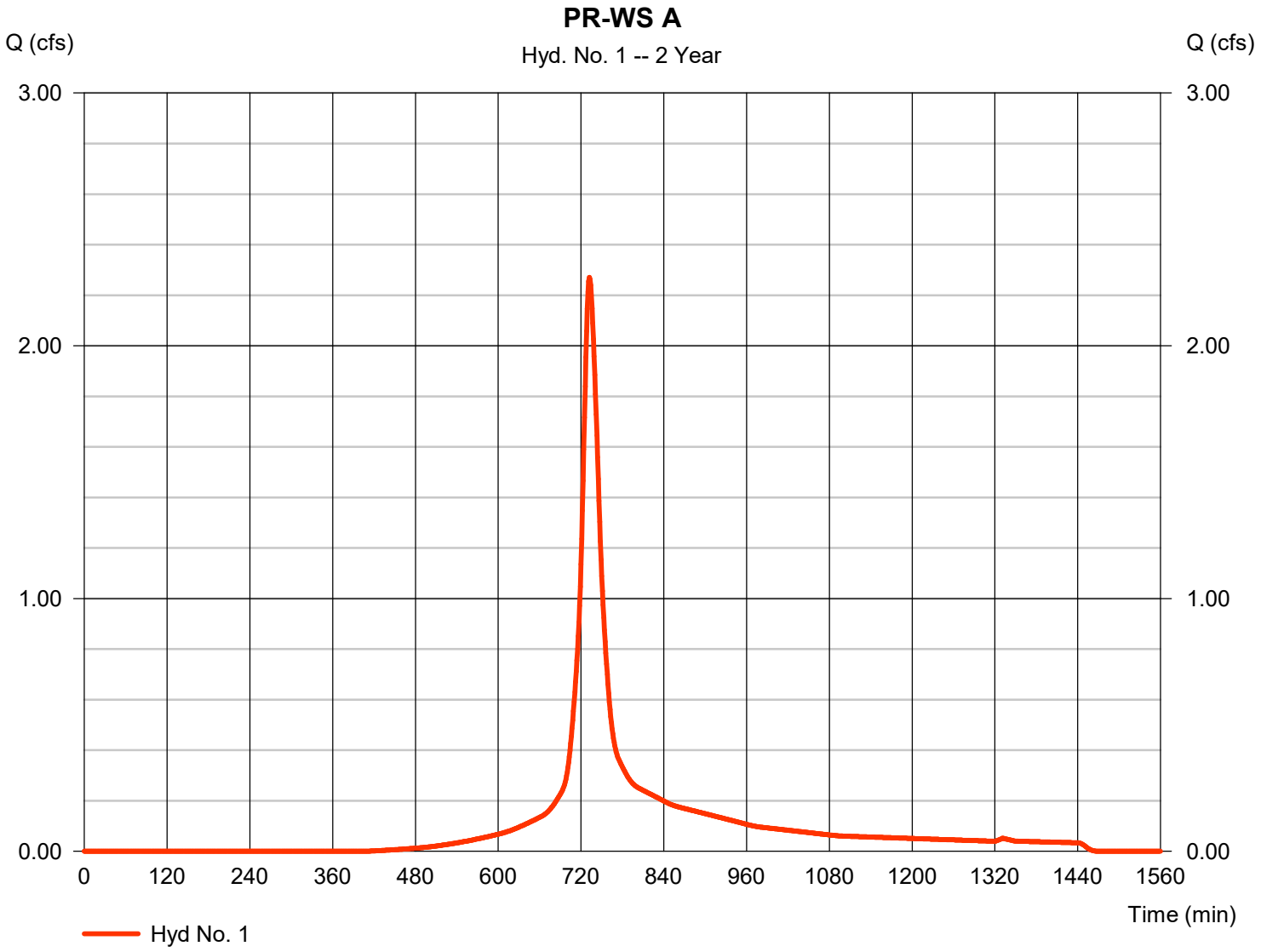
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.271	1	732	9,662	------	------	------	PR-WS A
2	SCS Runoff	1.746	1	734	7,755	------	------	------	PR-WS B1A (MC-3500)
3	SCS Runoff	1.538	1	729	5,884	------	------	------	PR-WS B1B (24IN PIPE)
4	Reservoir	0.847	1	753	6,539	2	100.95	2,758	MC 3500
5	Reservoir	1.528	1	730	5,883	3	100.25	148	24IN PIPE
6	SCS Runoff	1.151	1	743	6,688	------	------	------	PR-WS B2
7	Combine	2.870	1	740	19,111	4, 5, 6	------	------	TOTAL WS-B
8	Combine	4.839	1	734	28,773	1, 7	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

PR-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.271 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	9,662 cuft
Drainage area	=	1.290 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

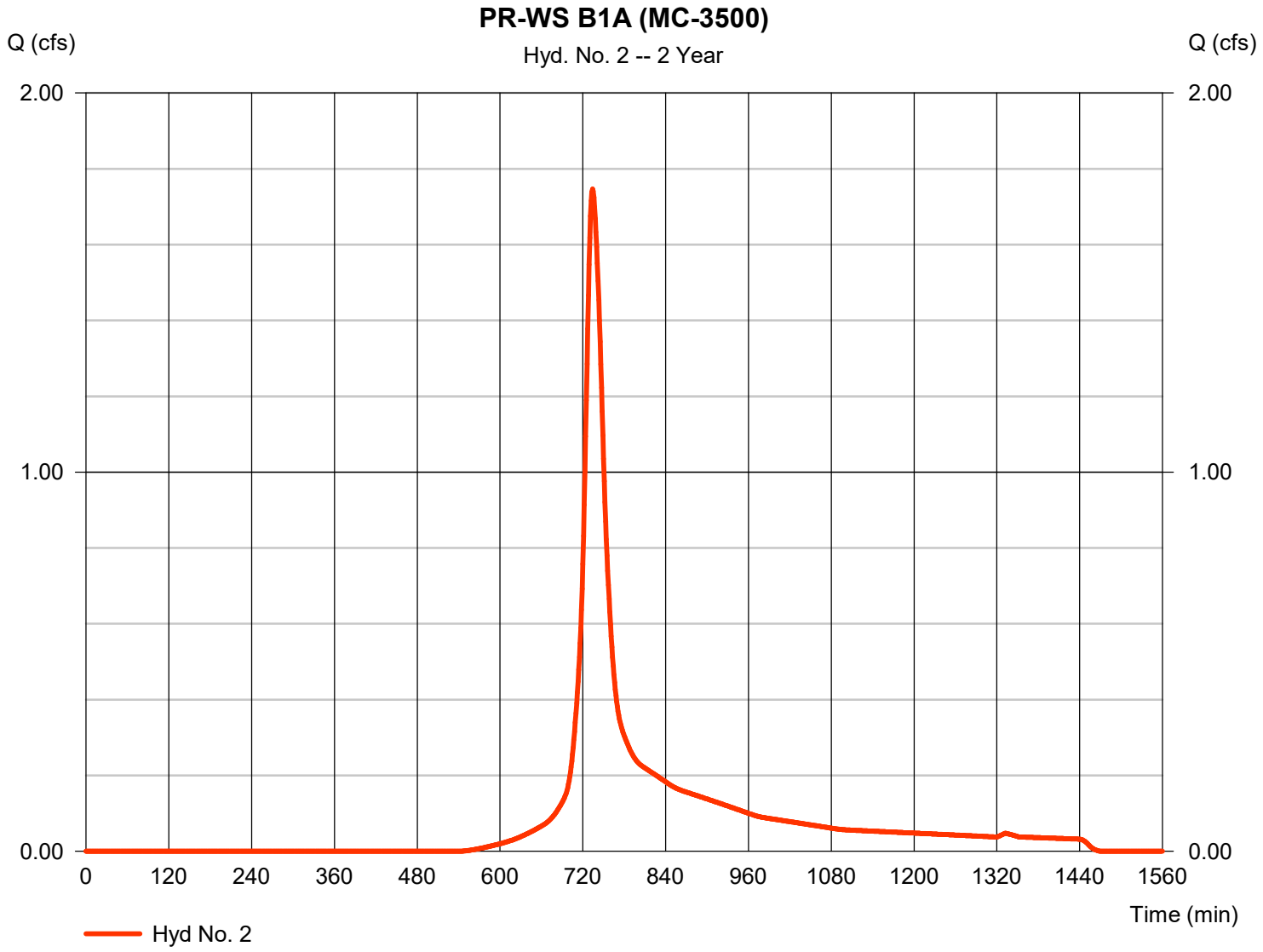


Hydrograph Report

Hyd. No. 2

PR-WS B1A (MC-3500)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.746 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 7,755 cuft
Drainage area	= 1.380 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.00 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

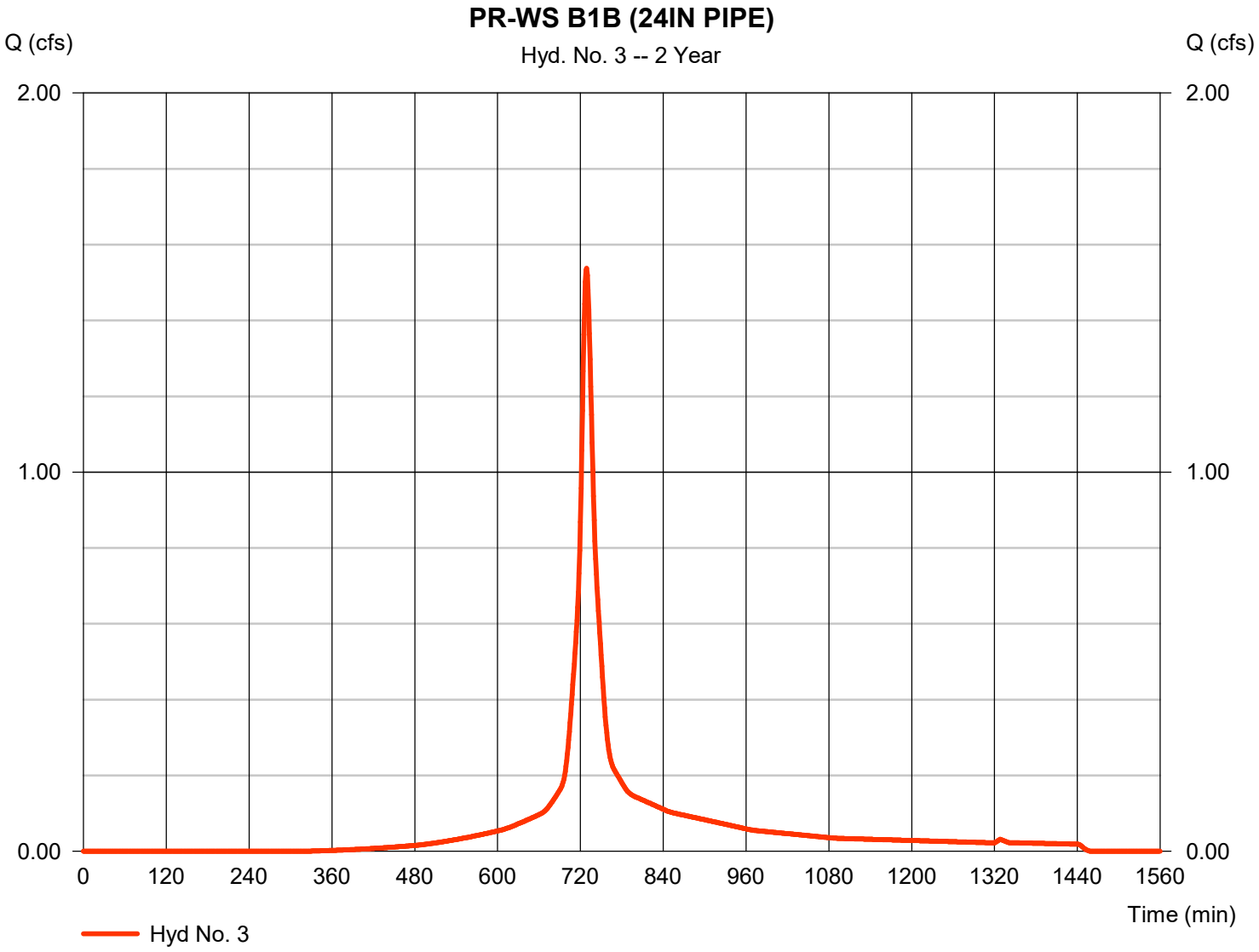


Hydrograph Report

Hyd. No. 3

PR-WS B1B (24IN PIPE)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.538 cfs
Storm frequency	=	2 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	5,884 cuft
Drainage area	=	0.700 ac	Curve number	=	91
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



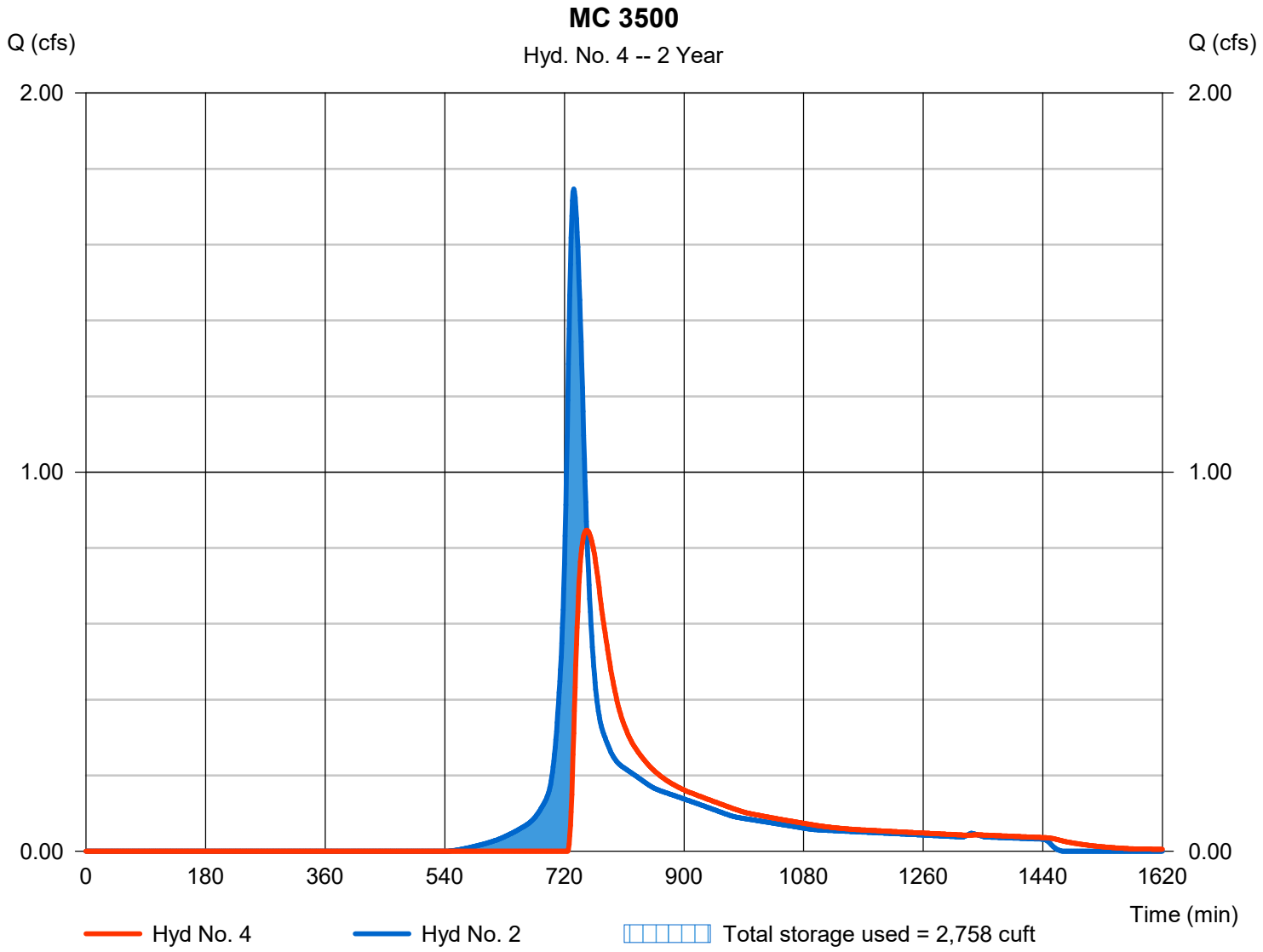
Hydrograph Report

Hyd. No. 4

MC 3500

Hydrograph type	=	Reservoir	Peak discharge	=	0.847 cfs
Storm frequency	=	2 yrs	Time to peak	=	753 min
Time interval	=	1 min	Hyd. volume	=	6,539 cuft
Inflow hyd. No.	=	2 - PR-WS B1A (MC-3500)	Max. Elevation	=	100.95 ft
Reservoir name	=	MC 3500	Max. Storage	=	2,758 cuft

Storage Indication method used.



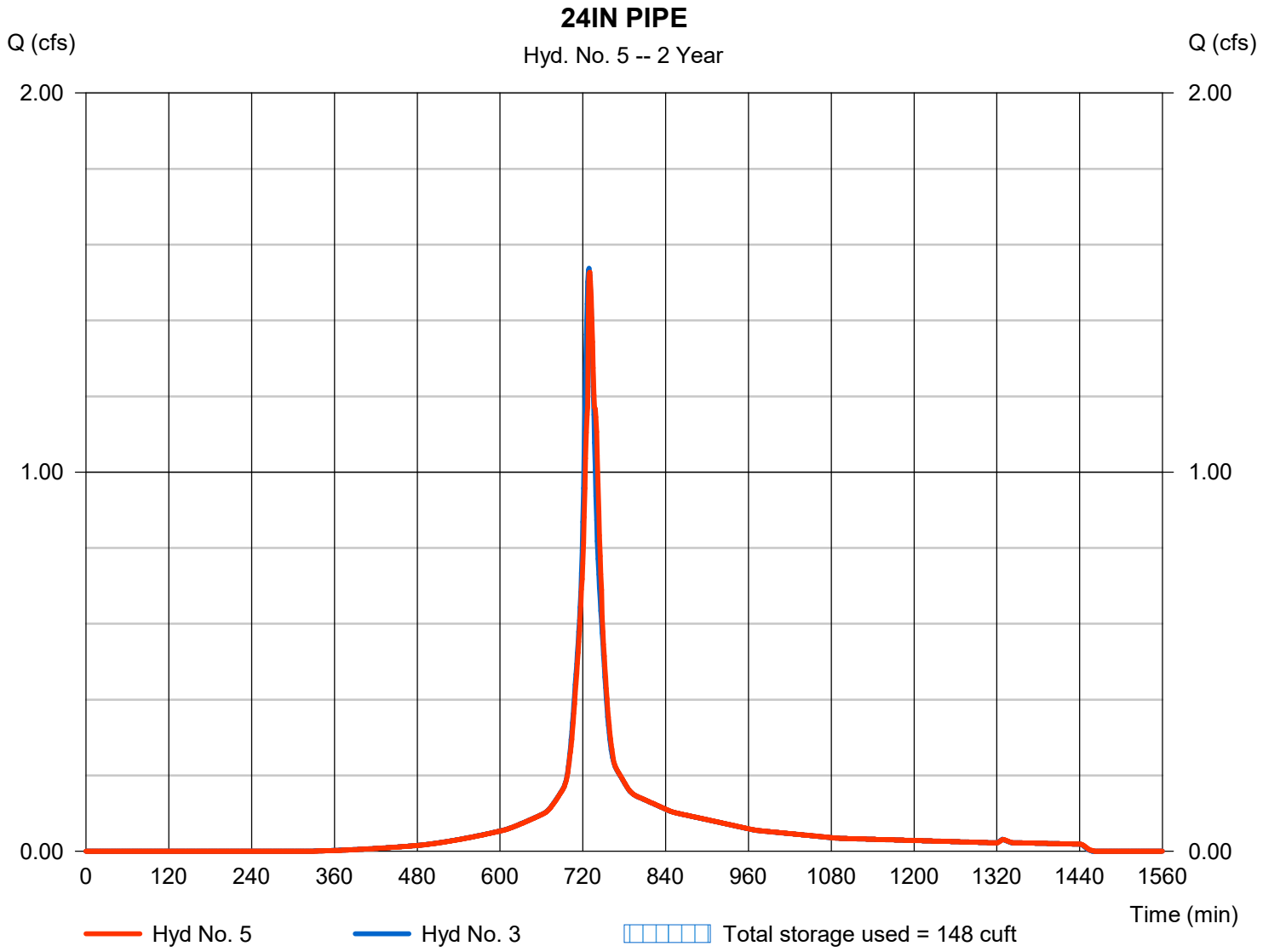
Hydrograph Report

Hyd. No. 5

24IN PIPE

Hydrograph type	=	Reservoir	Peak discharge	=	1.528 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	5,883 cuft
Inflow hyd. No.	=	3 - PR-WS B1B (24IN PIPE)	Max. Elevation	=	100.25 ft
Reservoir name	=	24IN PIPE	Max. Storage	=	148 cuft

Storage Indication method used.

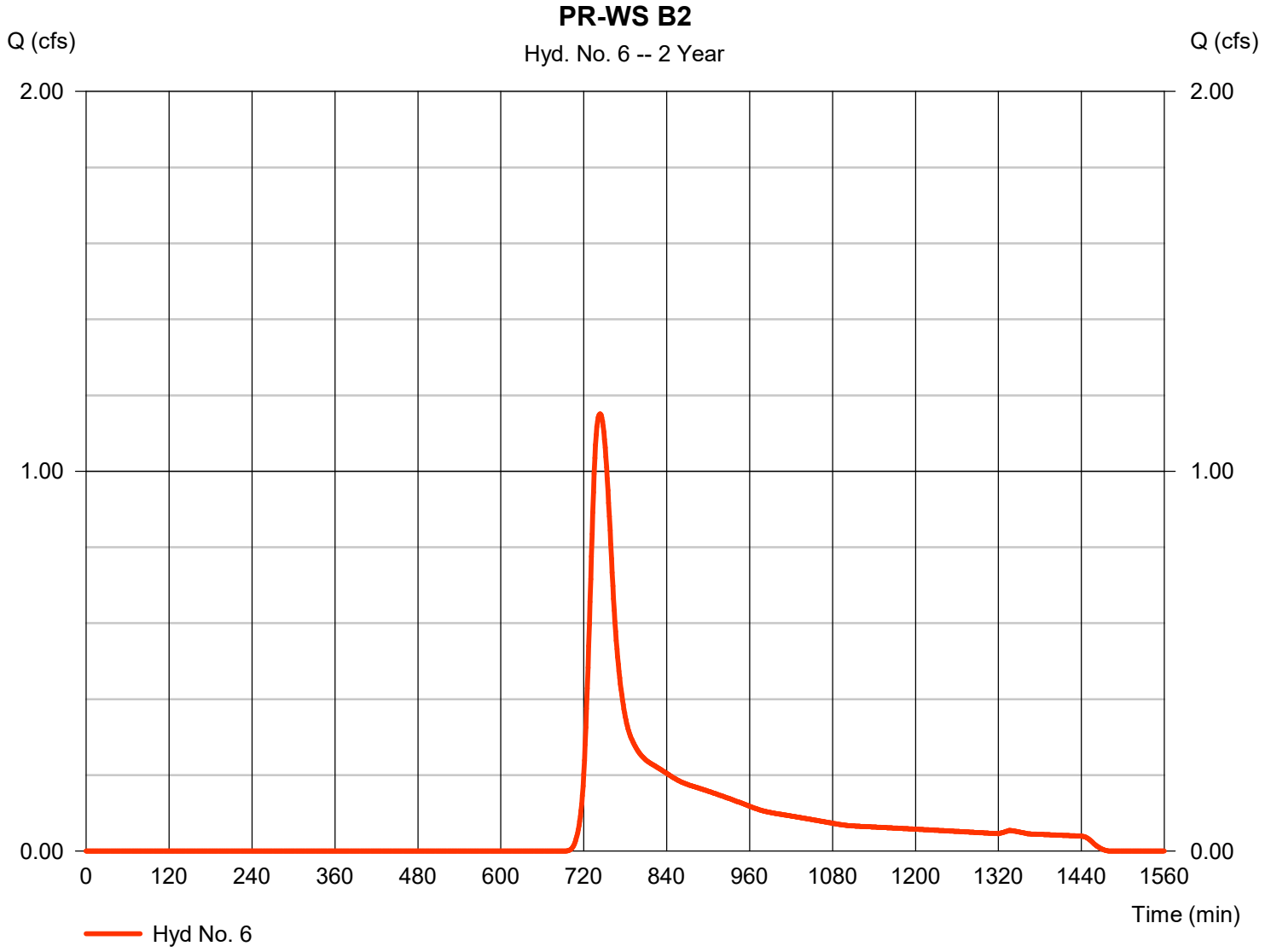


Hydrograph Report

Hyd. No. 6

PR-WS B2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.151 cfs
Storm frequency	=	2 yrs	Time to peak	=	743 min
Time interval	=	1 min	Hyd. volume	=	6,688 cuft
Drainage area	=	2.470 ac	Curve number	=	67
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

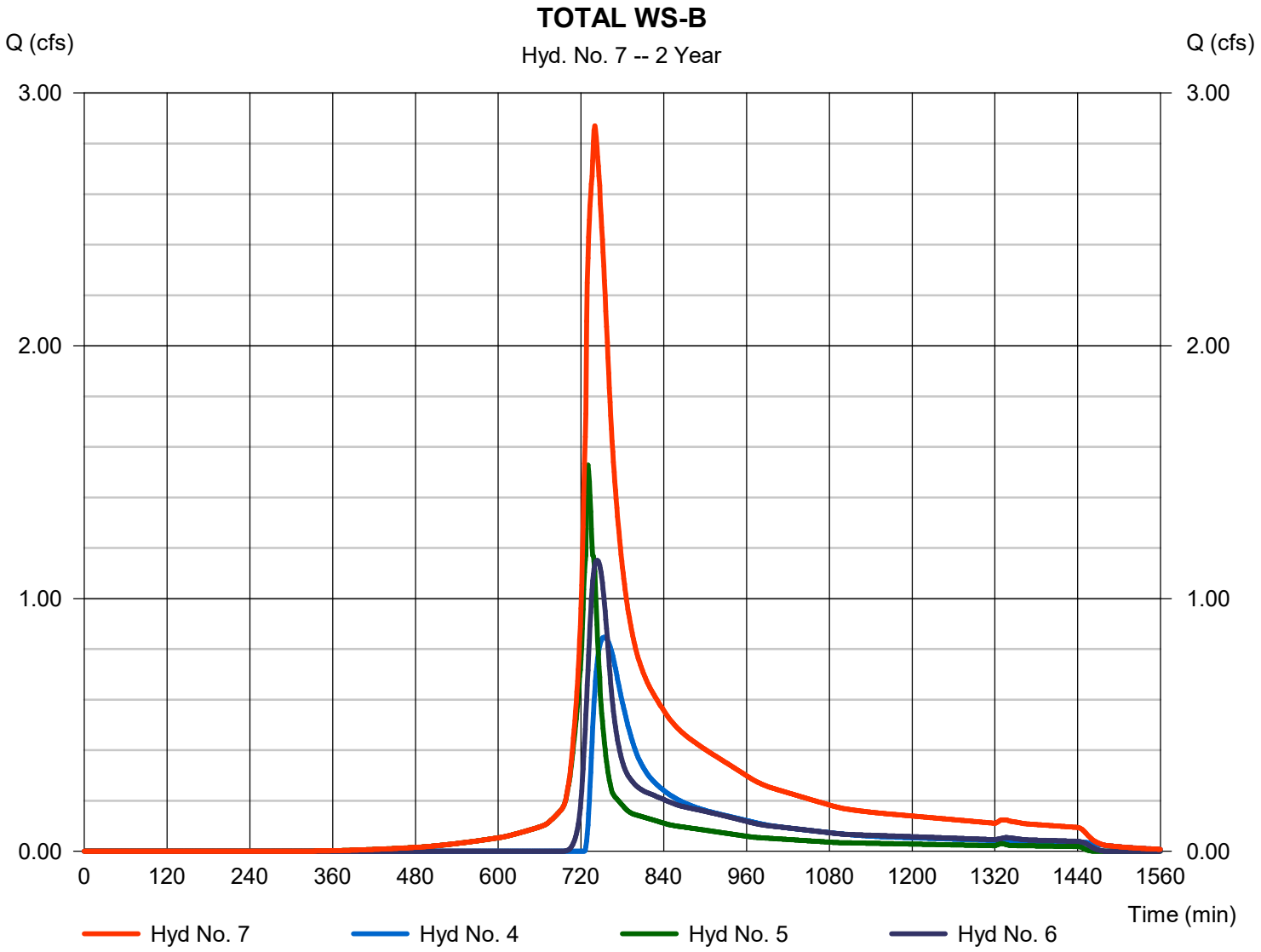


Hydrograph Report

Hyd. No. 7

TOTAL WS-B

Hydrograph type	= Combine	Peak discharge	= 2.870 cfs
Storm frequency	= 2 yrs	Time to peak	= 740 min
Time interval	= 1 min	Hyd. volume	= 19,111 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 2.470 ac

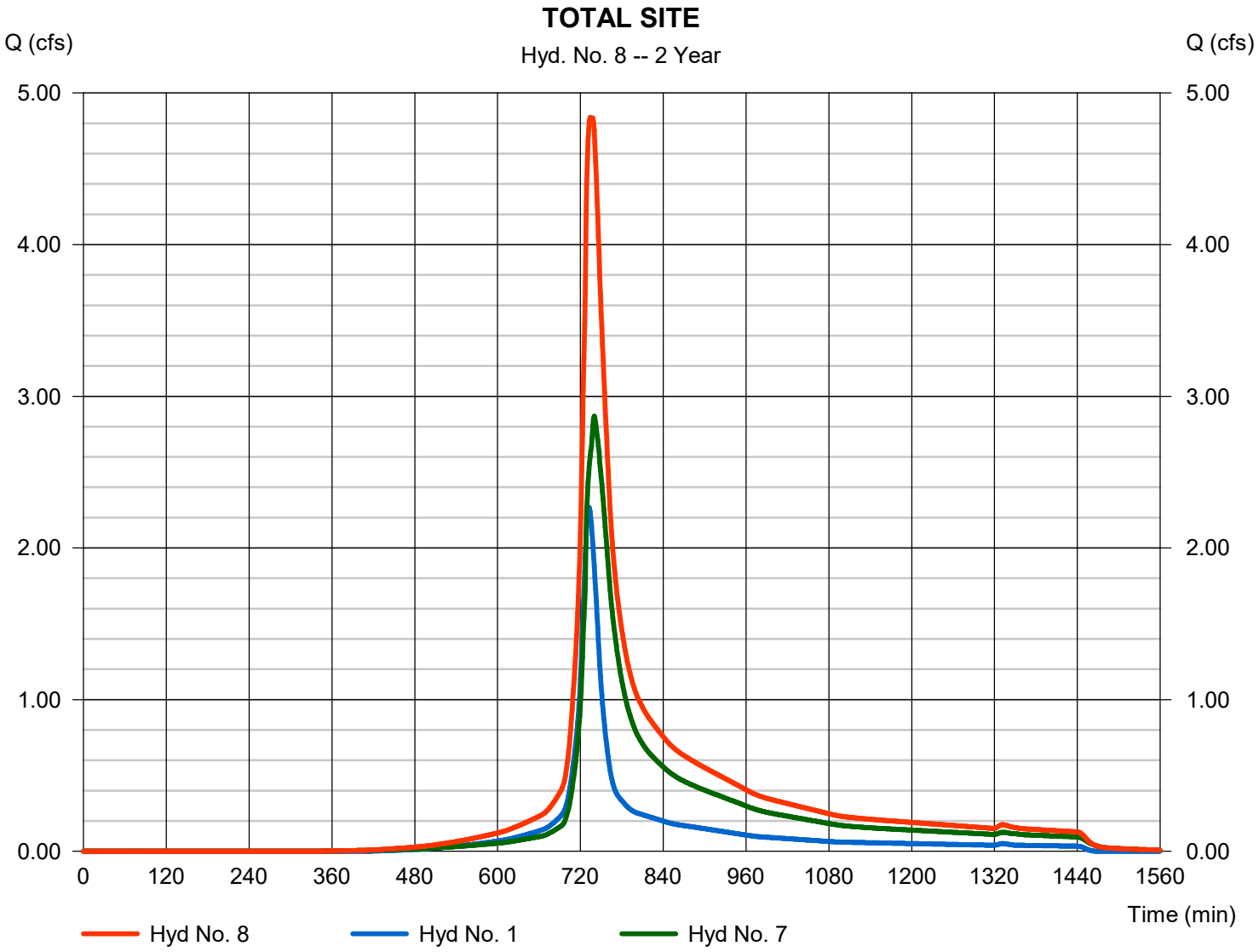


Hydrograph Report

Hyd. No. 8

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 4.839 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 28,773 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.290 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

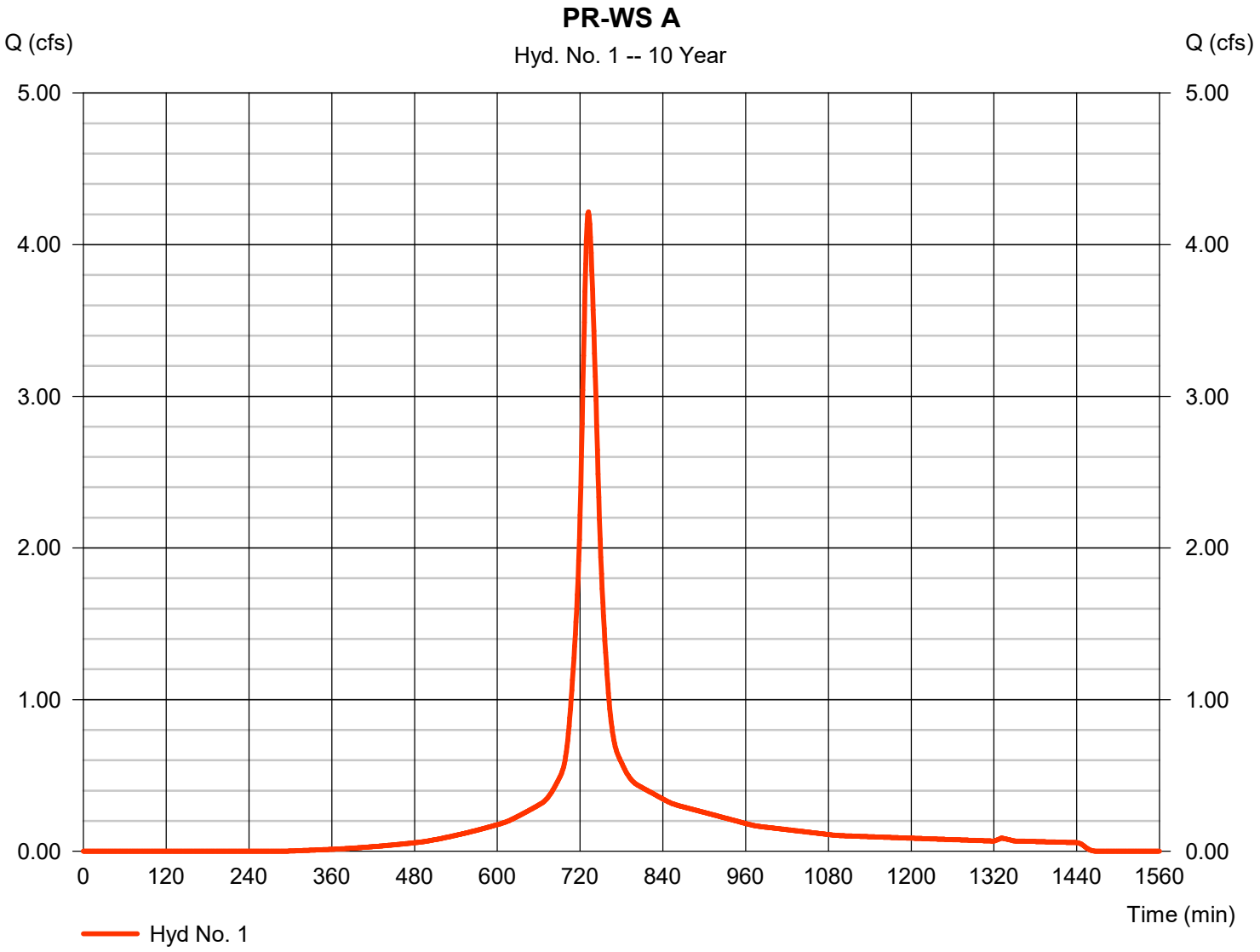
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.216	1	732	18,308	------	------	------	PR-WS A
2	SCS Runoff	3.686	1	733	16,290	------	------	------	PR-WS B1A (MC-3500)
3	SCS Runoff	2.713	1	729	10,690	------	------	------	PR-WS B1B (24IN PIPE)
4	Reservoir	2.396	1	747	15,074	2	102.03	4,987	MC 3500
5	Reservoir	2.681	1	730	10,690	3	100.48	219	24IN PIPE
6	SCS Runoff	3.545	1	740	18,207	------	------	------	PR-WS B2
7	Combine	7.147	1	737	43,971	4, 5, 6	------	------	TOTAL WS-B
8	Combine	11.15	1	734	62,279	1, 7	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

PR-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.216 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	18,308 cuft
Drainage area	=	1.290 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

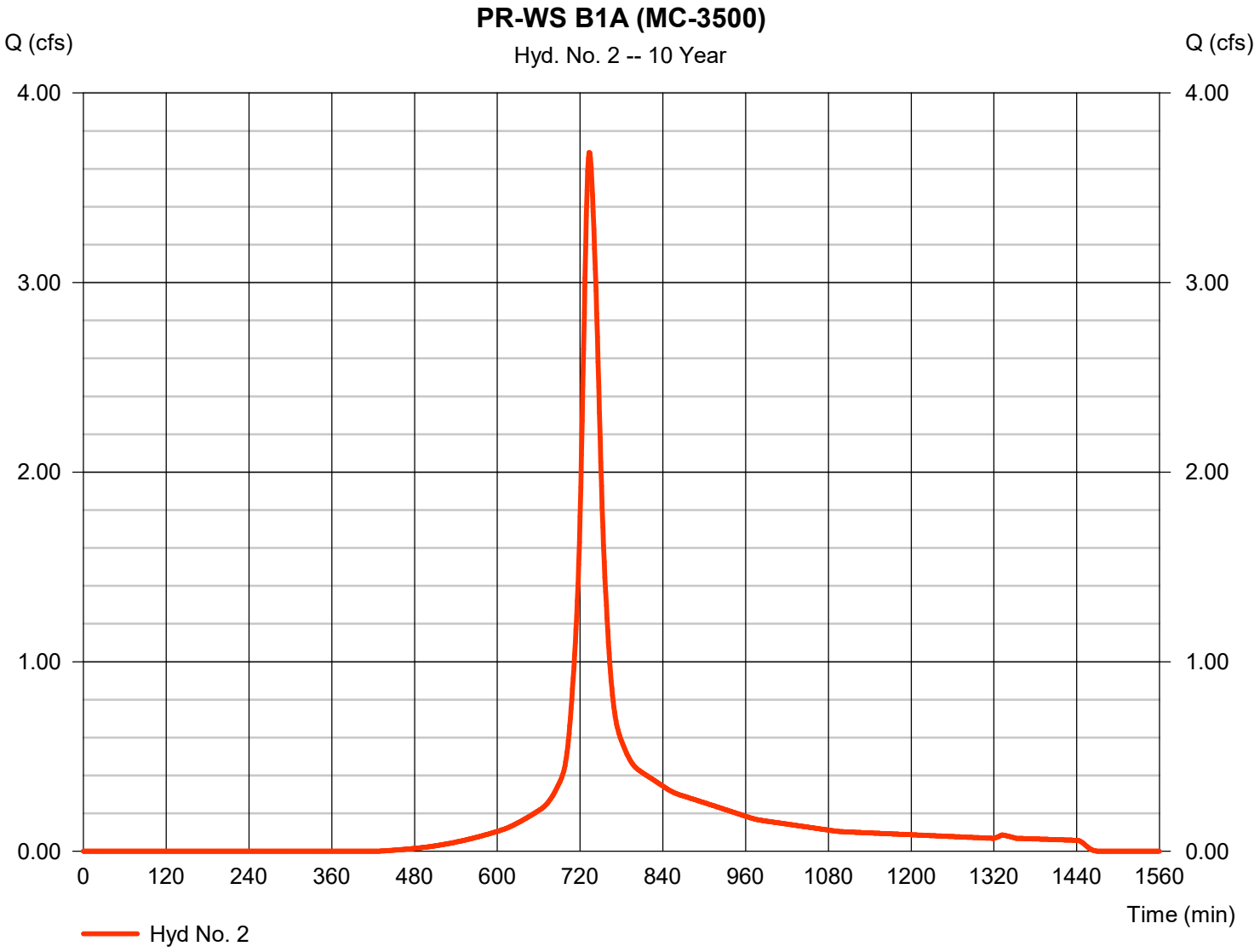


Hydrograph Report

Hyd. No. 2

PR-WS B1A (MC-3500)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.686 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	16,290 cuft
Drainage area	=	1.380 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.00 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

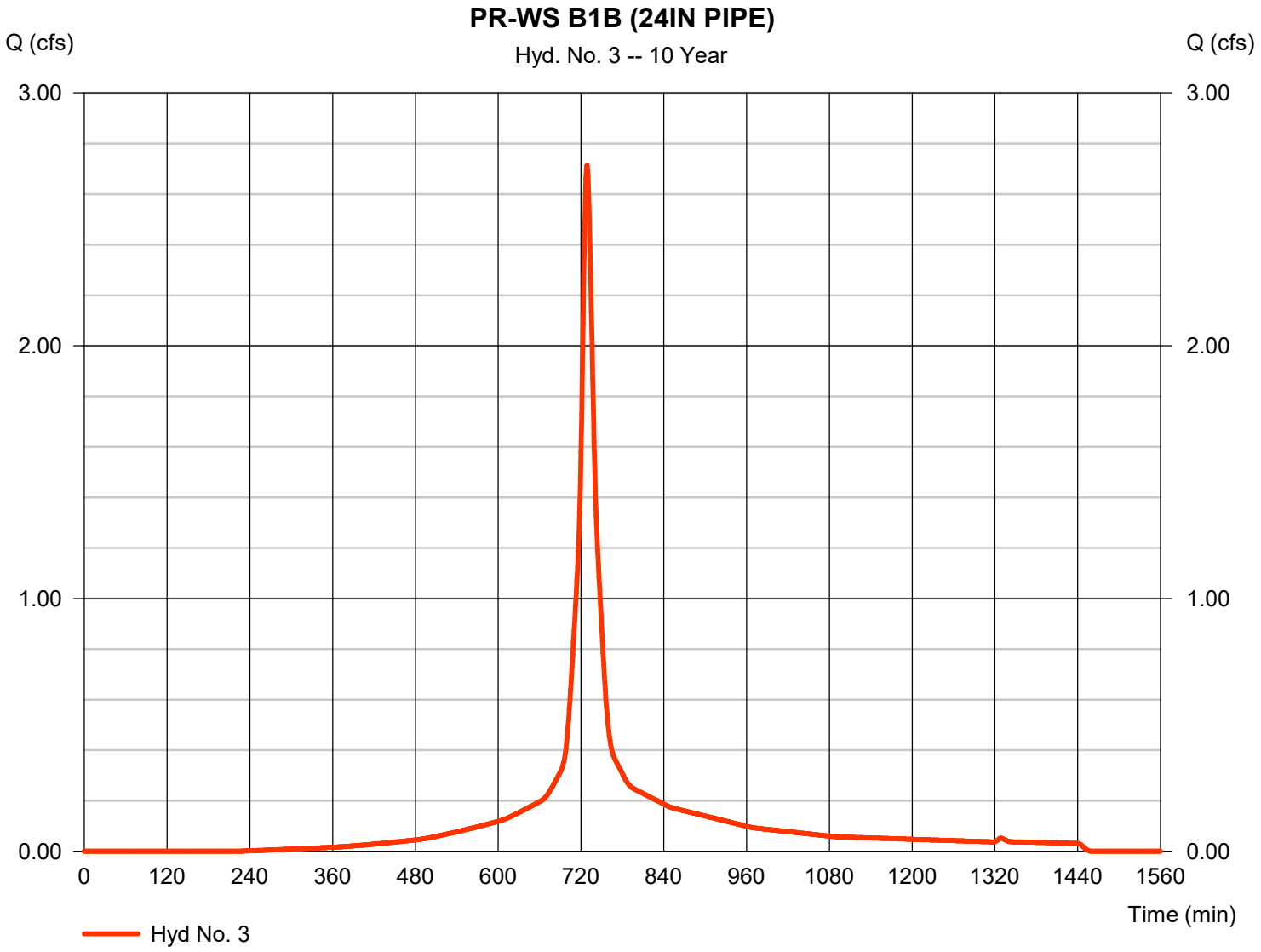


Hydrograph Report

Hyd. No. 3

PR-WS B1B (24IN PIPE)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.713 cfs
Storm frequency	=	10 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	10,690 cuft
Drainage area	=	0.700 ac	Curve number	=	91
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



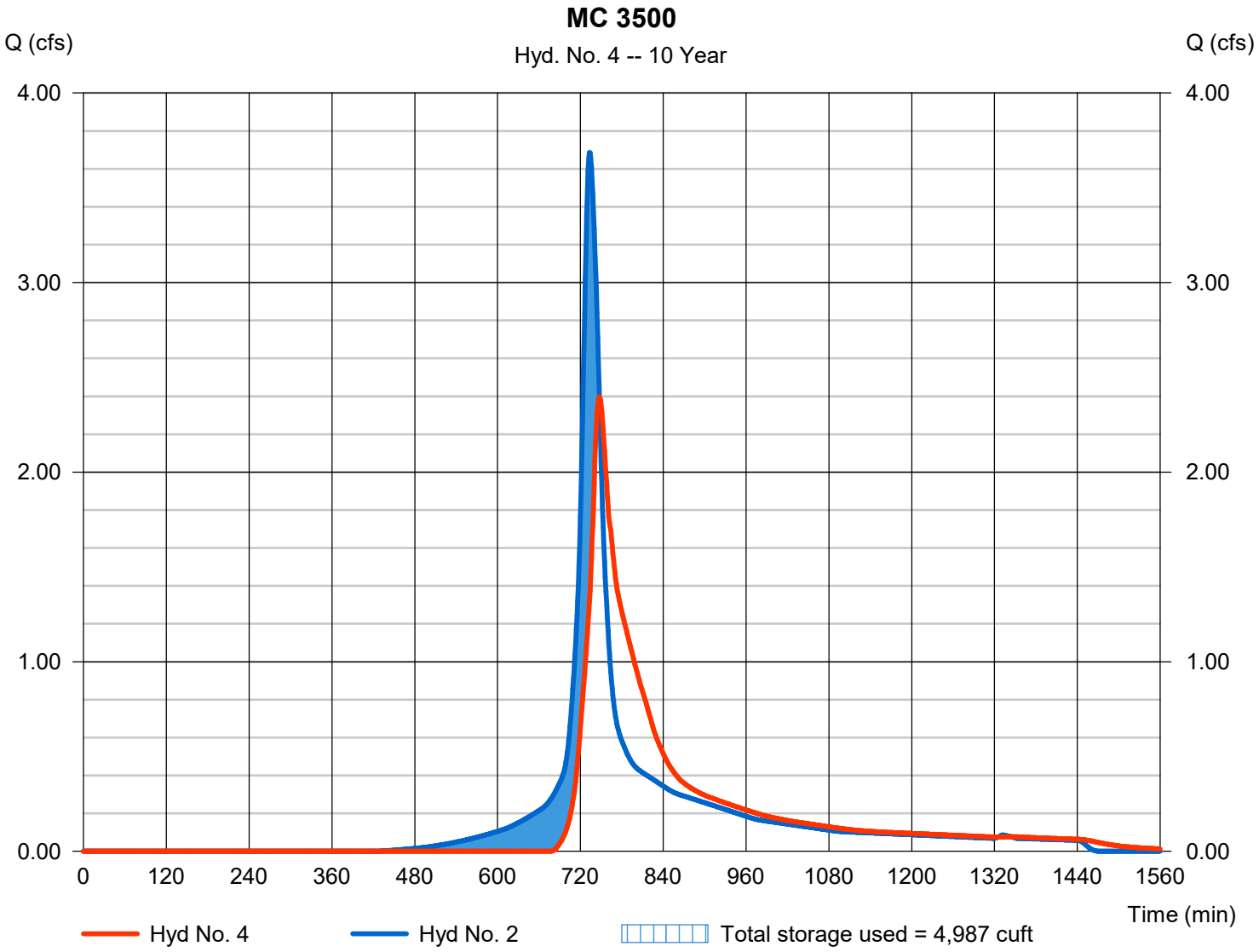
Hydrograph Report

Hyd. No. 4

MC 3500

Hydrograph type	=	Reservoir	Peak discharge	=	2.396 cfs
Storm frequency	=	10 yrs	Time to peak	=	747 min
Time interval	=	1 min	Hyd. volume	=	15,074 cuft
Inflow hyd. No.	=	2 - PR-WS B1A (MC-3500)	Max. Elevation	=	102.03 ft
Reservoir name	=	MC 3500	Max. Storage	=	4,987 cuft

Storage Indication method used.



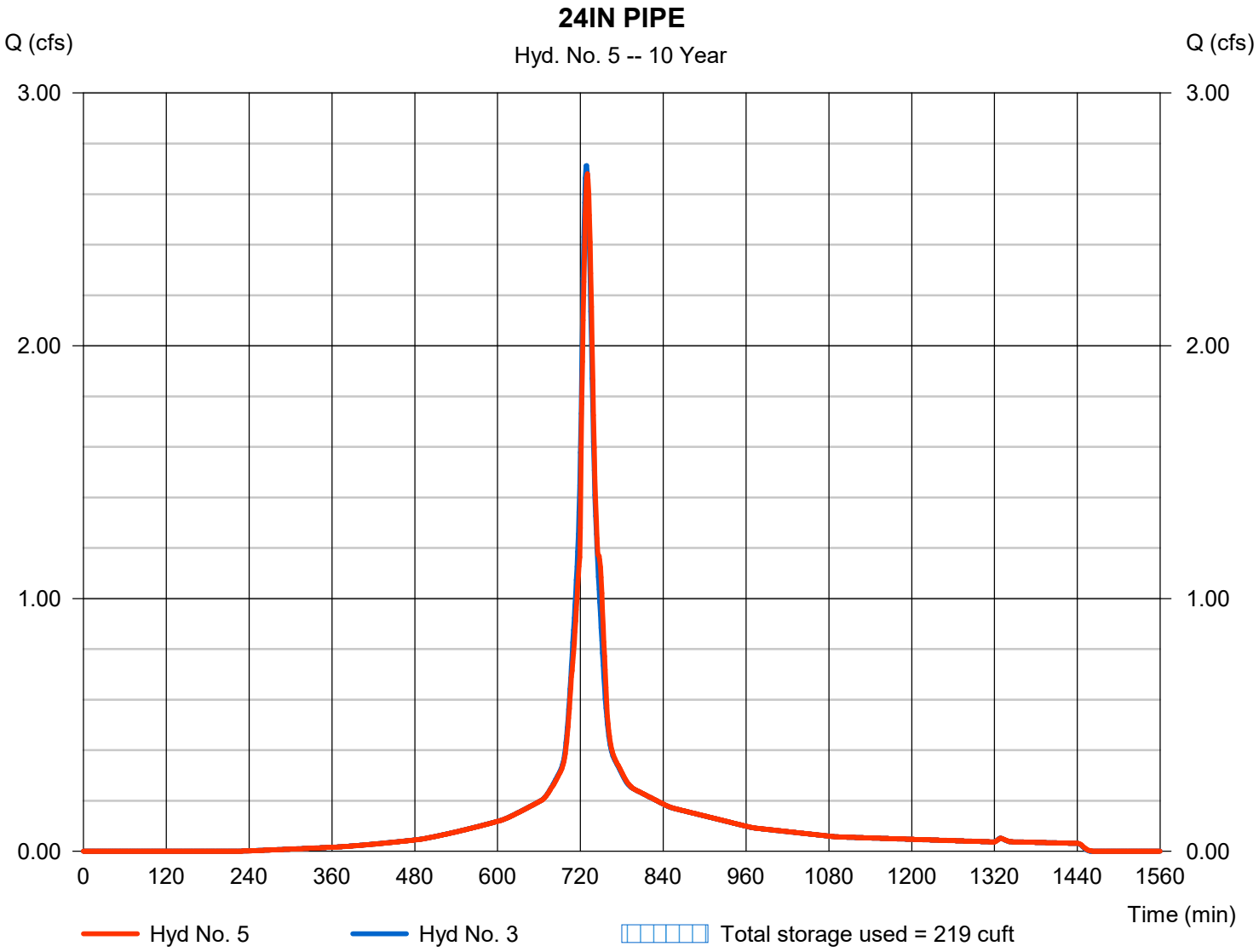
Hydrograph Report

Hyd. No. 5

24IN PIPE

Hydrograph type	=	Reservoir	Peak discharge	=	2.681 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	10,690 cuft
Inflow hyd. No.	=	3 - PR-WS B1B (24IN PIPE)	Max. Elevation	=	100.48 ft
Reservoir name	=	24IN PIPE	Max. Storage	=	219 cuft

Storage Indication method used.

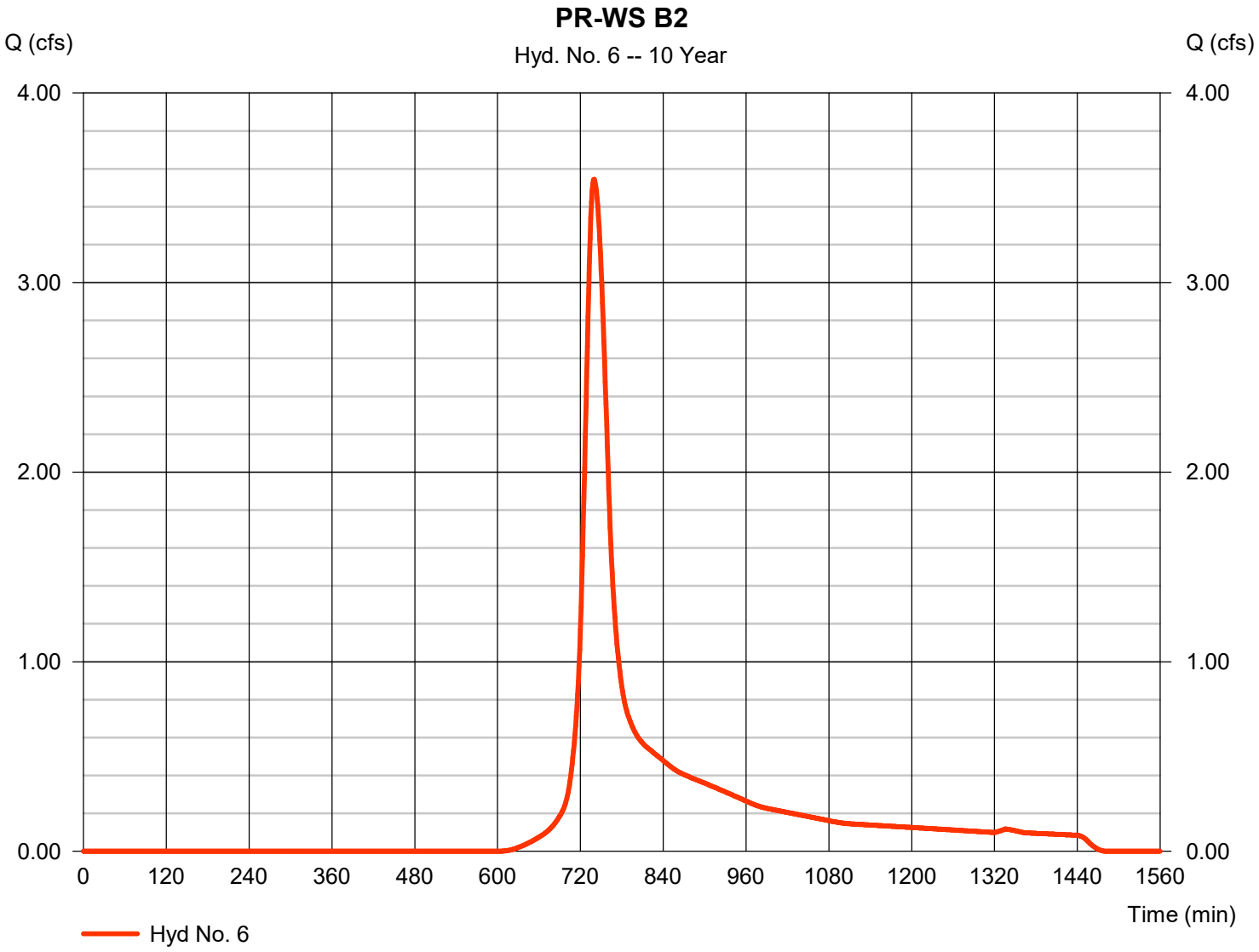


Hydrograph Report

Hyd. No. 6

PR-WS B2

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.545 cfs
Storm frequency	=	10 yrs	Time to peak	=	740 min
Time interval	=	1 min	Hyd. volume	=	18,207 cuft
Drainage area	=	2.470 ac	Curve number	=	67
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

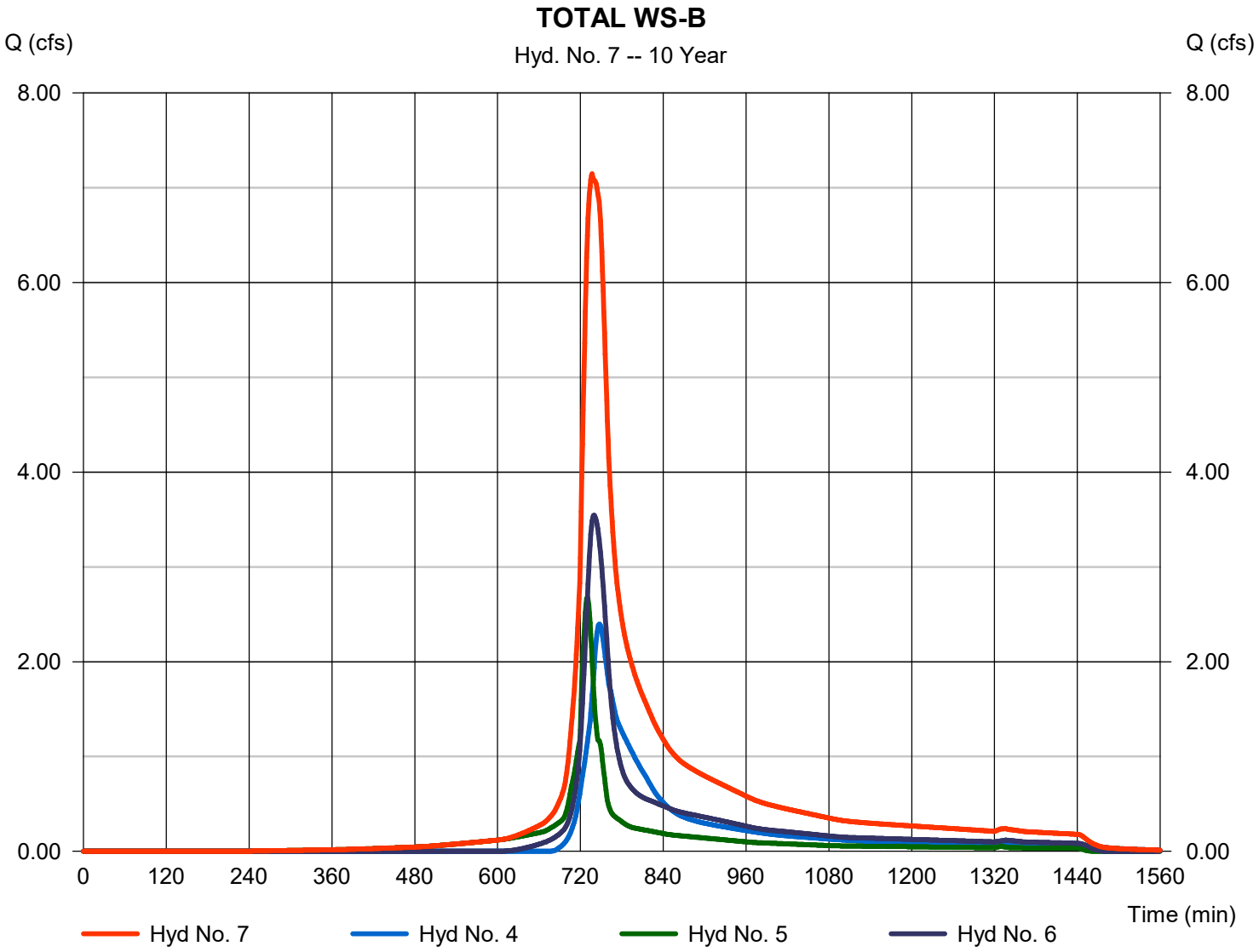


Hydrograph Report

Hyd. No. 7

TOTAL WS-B

Hydrograph type	= Combine	Peak discharge	= 7.147 cfs
Storm frequency	= 10 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 43,971 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 2.470 ac

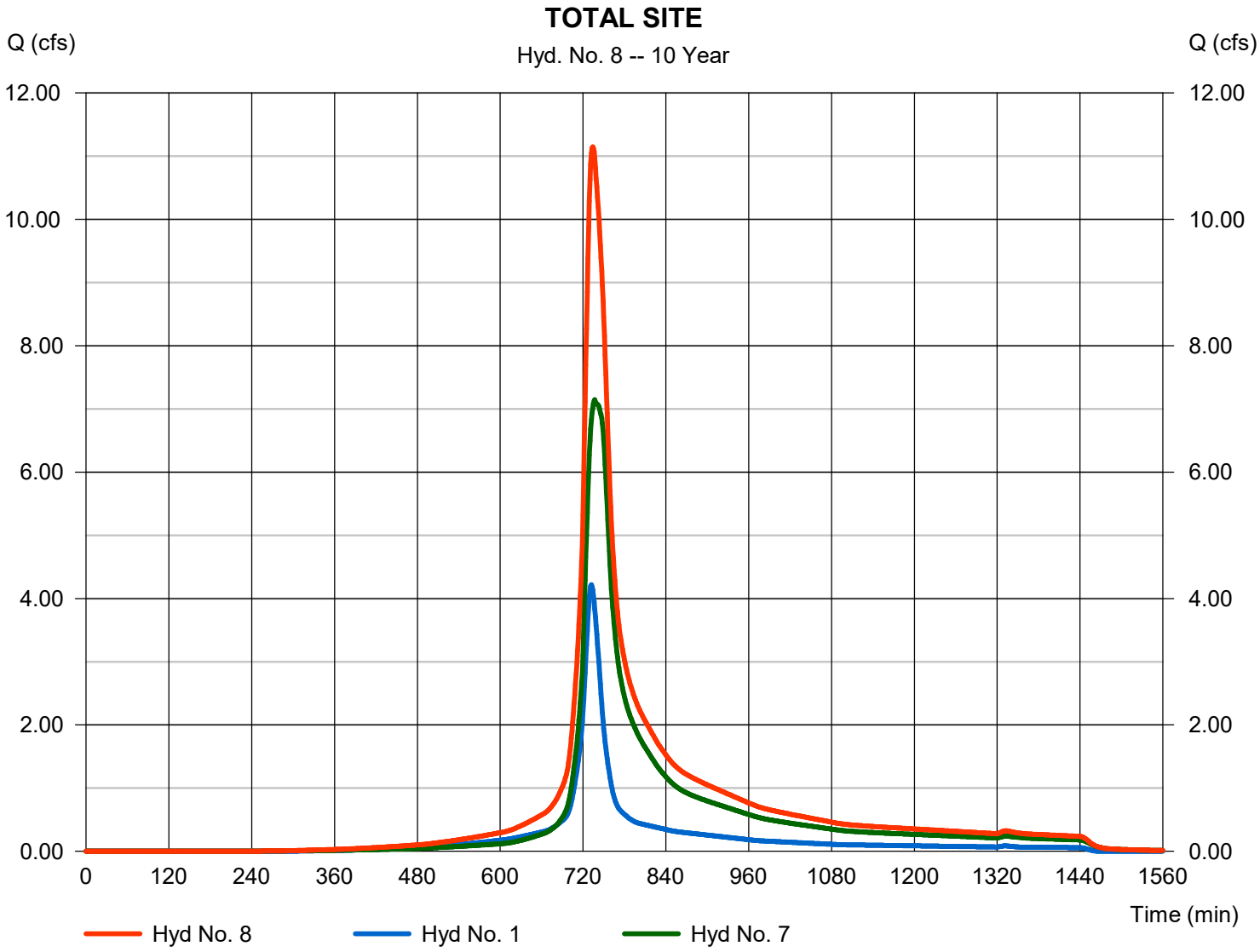


Hydrograph Report

Hyd. No. 8

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 11.15 cfs
Storm frequency	= 10 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 62,279 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.290 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

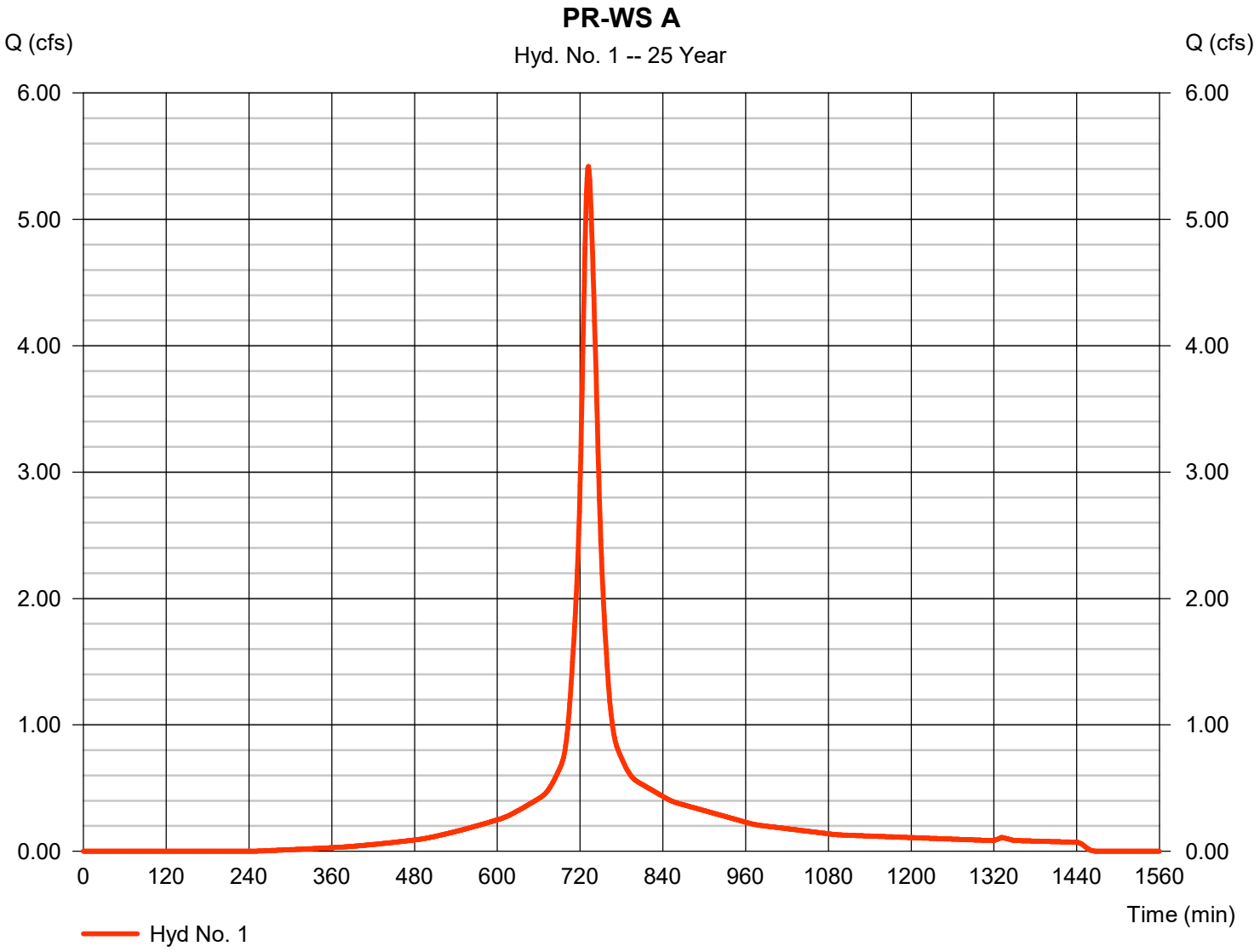
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	5.419	1	732	23,829	------	------	------	PR-WS A
2	SCS Runoff	4.937	1	733	21,936	------	------	------	PR-WS B1A (MC-3500)
3	SCS Runoff	3.435	1	728	13,724	------	------	------	PR-WS B1B (24IN PIPE)
4	Reservoir	3.666	1	744	20,720	2	102.43	5,756	MC 3500
5	Reservoir	3.372	1	730	13,723	3	100.68	284	24IN PIPE
6	SCS Runoff	5.283	1	739	26,605	------	------	------	PR-WS B2
7	Combine	10.99	1	738	61,048	4, 5, 6	------	------	TOTAL WS-B
8	Combine	15.97	1	736	84,878	1, 7	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

PR-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.419 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	23,829 cuft
Drainage area	=	1.290 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	6.54 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

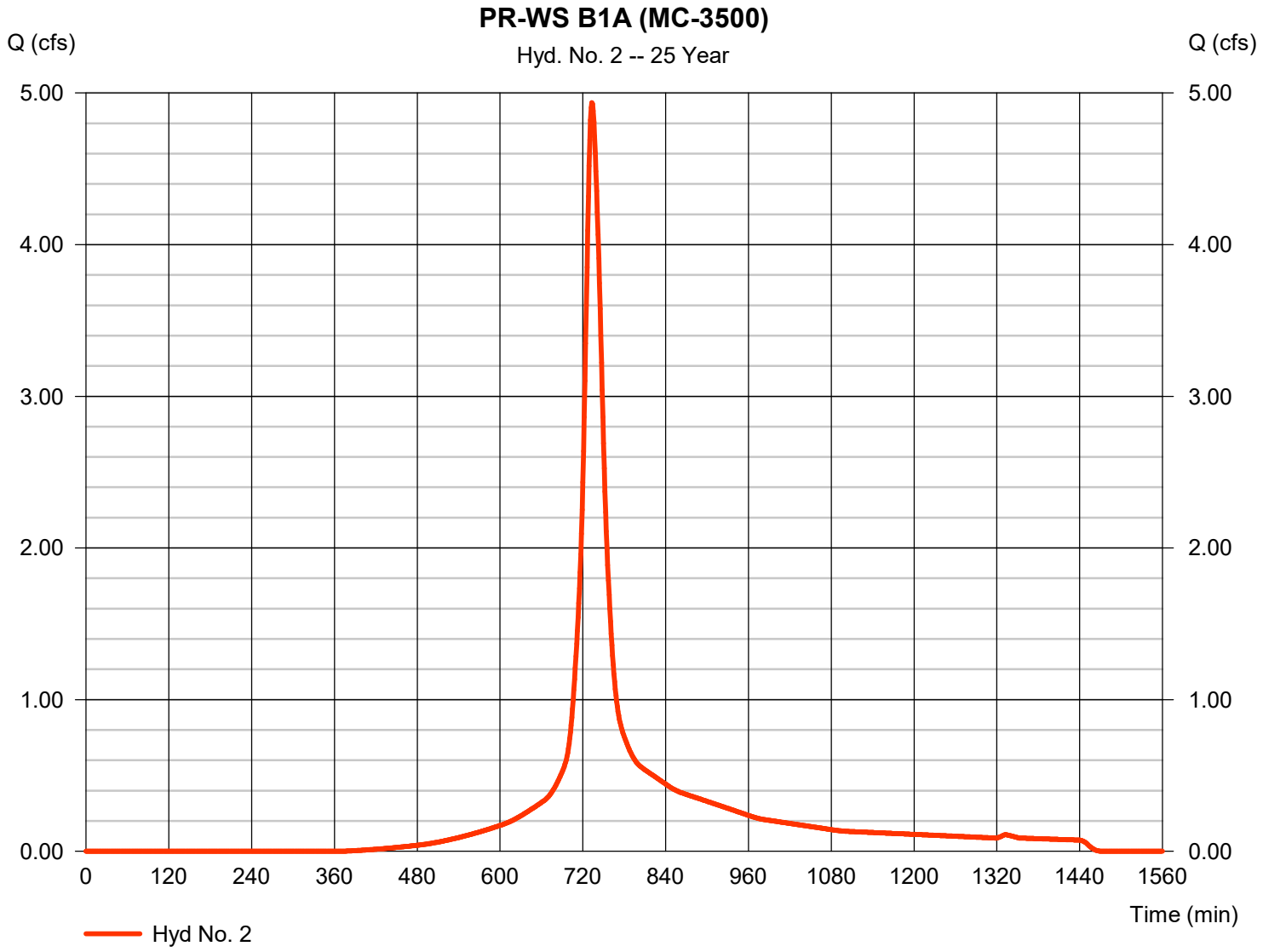


Hydrograph Report

Hyd. No. 2

PR-WS B1A (MC-3500)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.937 cfs
Storm frequency	=	25 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	21,936 cuft
Drainage area	=	1.380 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.00 min
Total precip.	=	6.54 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

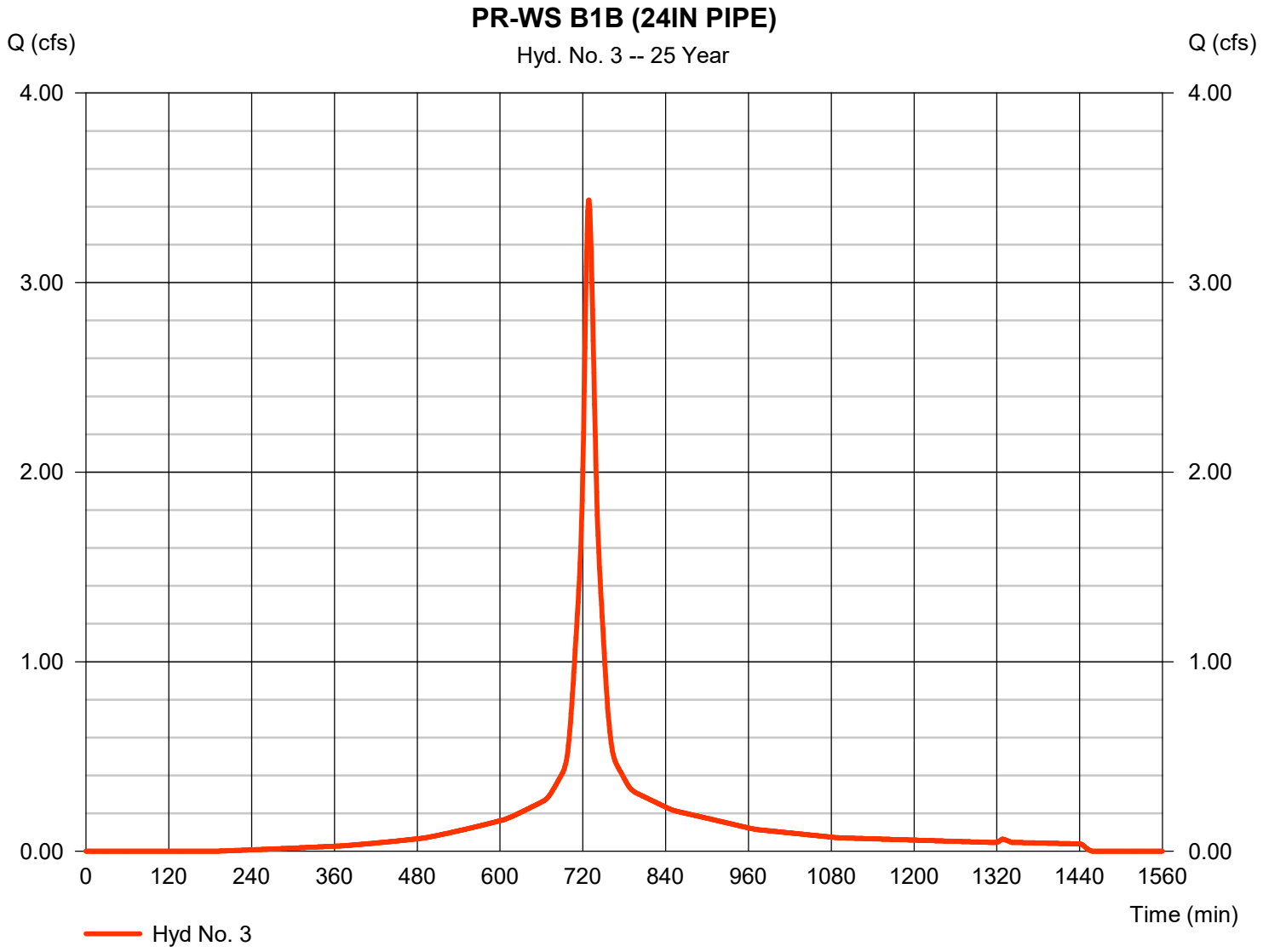


Hydrograph Report

Hyd. No. 3

PR-WS B1B (24IN PIPE)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.435 cfs
Storm frequency	=	25 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	13,724 cuft
Drainage area	=	0.700 ac	Curve number	=	91
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	6.54 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



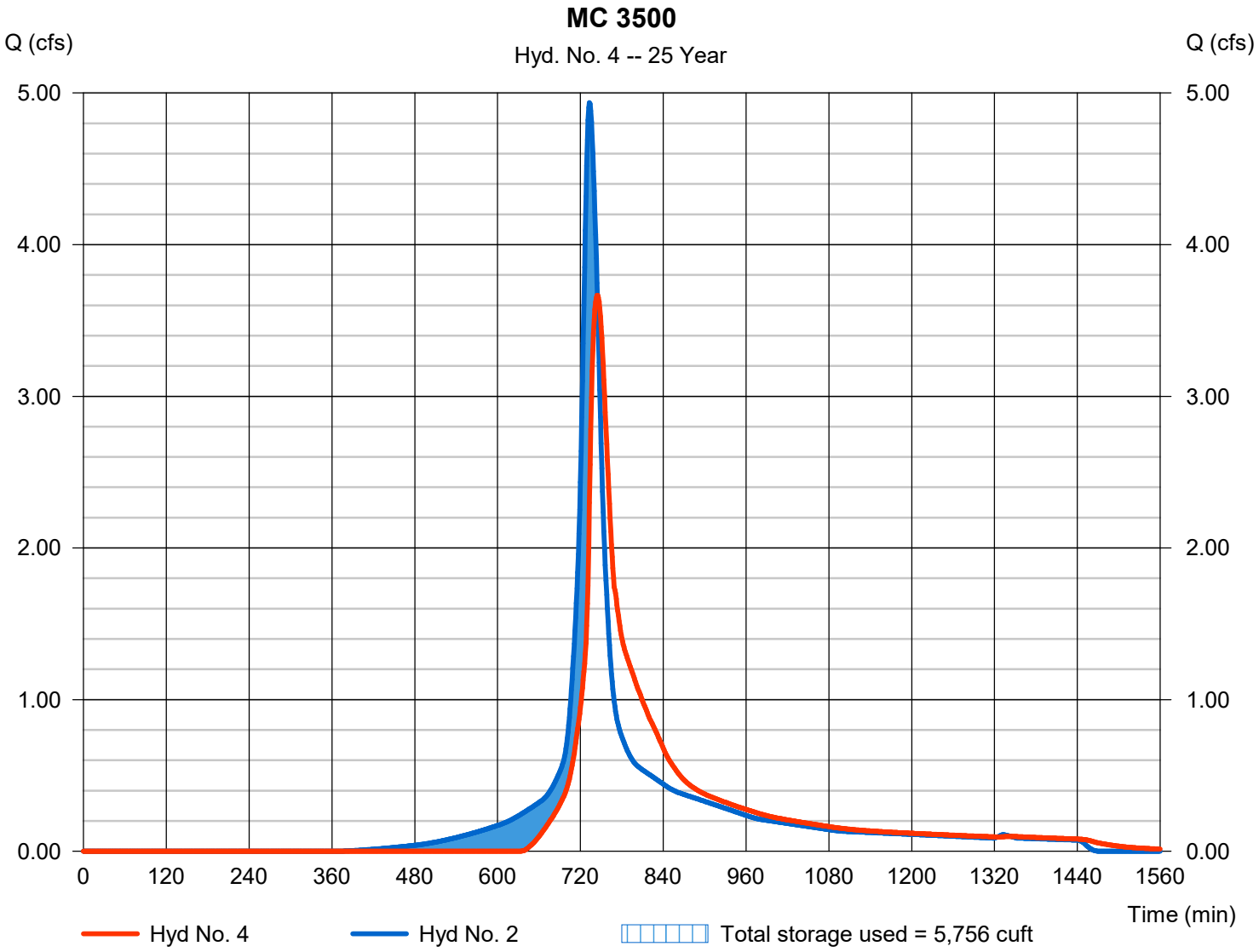
Hydrograph Report

Hyd. No. 4

MC 3500

Hydrograph type	=	Reservoir	Peak discharge	=	3.666 cfs
Storm frequency	=	25 yrs	Time to peak	=	744 min
Time interval	=	1 min	Hyd. volume	=	20,720 cuft
Inflow hyd. No.	=	2 - PR-WS B1A (MC-3500)	Max. Elevation	=	102.43 ft
Reservoir name	=	MC 3500	Max. Storage	=	5,756 cuft

Storage Indication method used.



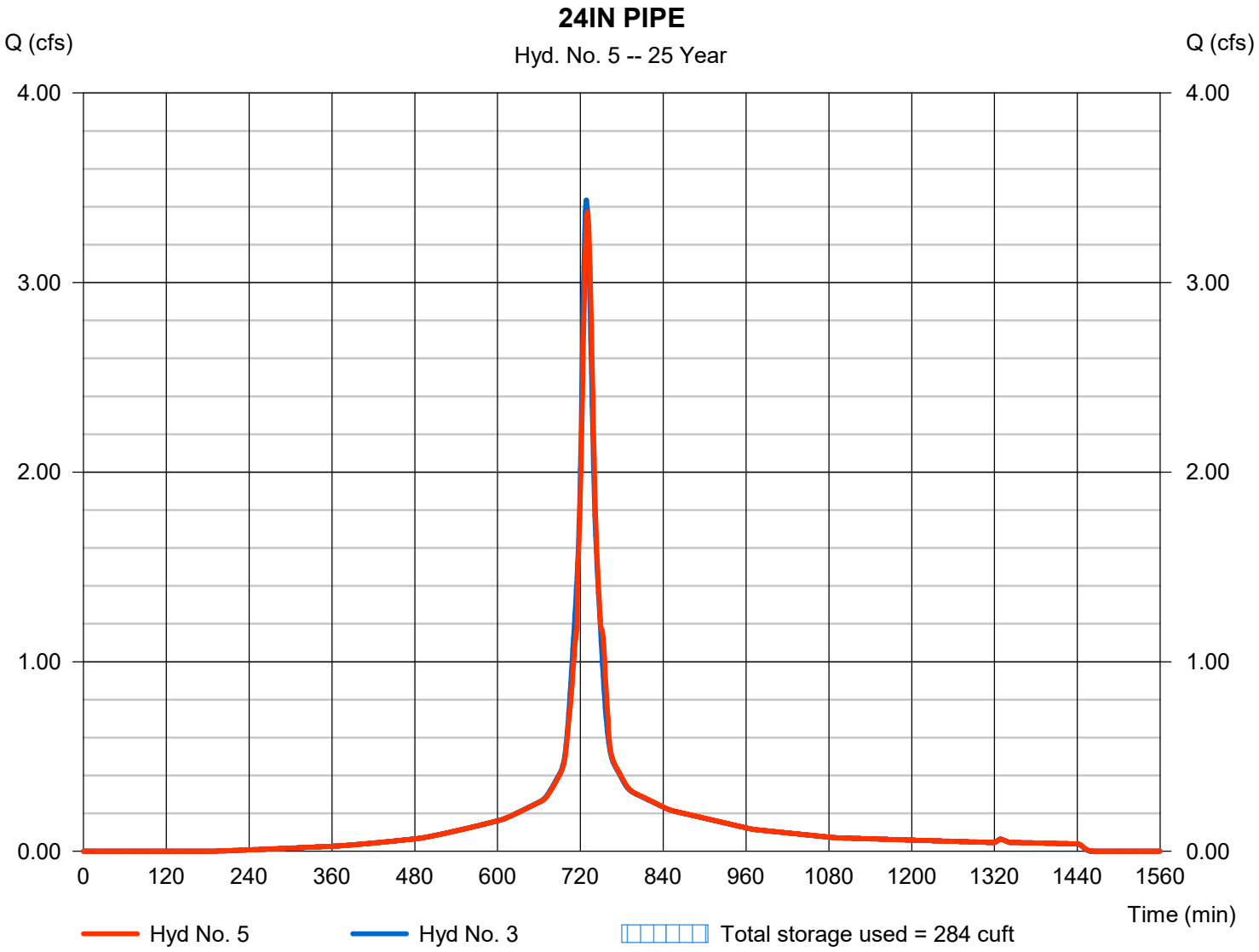
Hydrograph Report

Hyd. No. 5

24IN PIPE

Hydrograph type	=	Reservoir	Peak discharge	=	3.372 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	13,723 cuft
Inflow hyd. No.	=	3 - PR-WS B1B (24IN PIPE)	Max. Elevation	=	100.68 ft
Reservoir name	=	24IN PIPE	Max. Storage	=	284 cuft

Storage Indication method used.

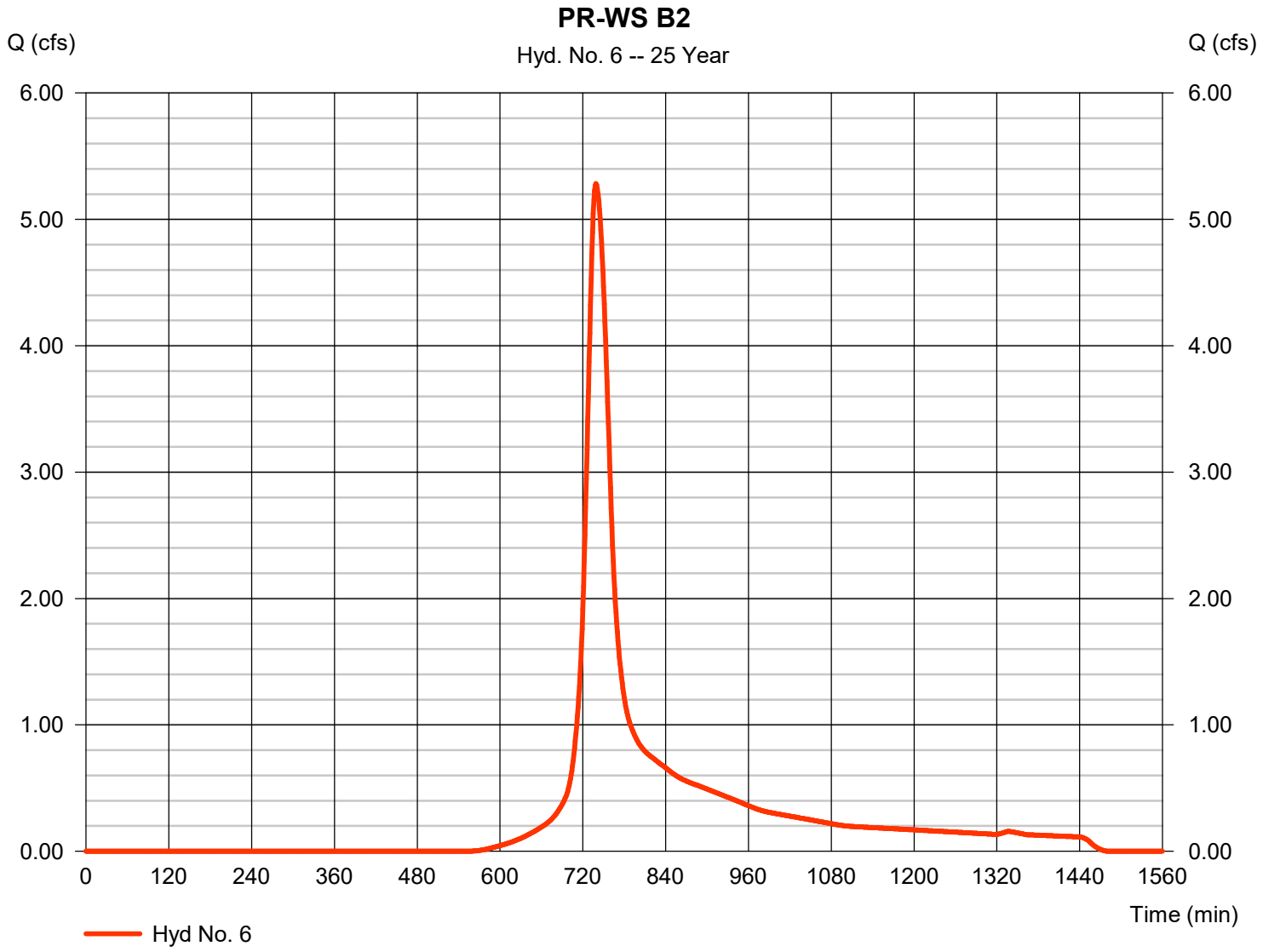


Hydrograph Report

Hyd. No. 6

PR-WS B2

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.283 cfs
Storm frequency	=	25 yrs	Time to peak	=	739 min
Time interval	=	1 min	Hyd. volume	=	26,605 cuft
Drainage area	=	2.470 ac	Curve number	=	67
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	6.54 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

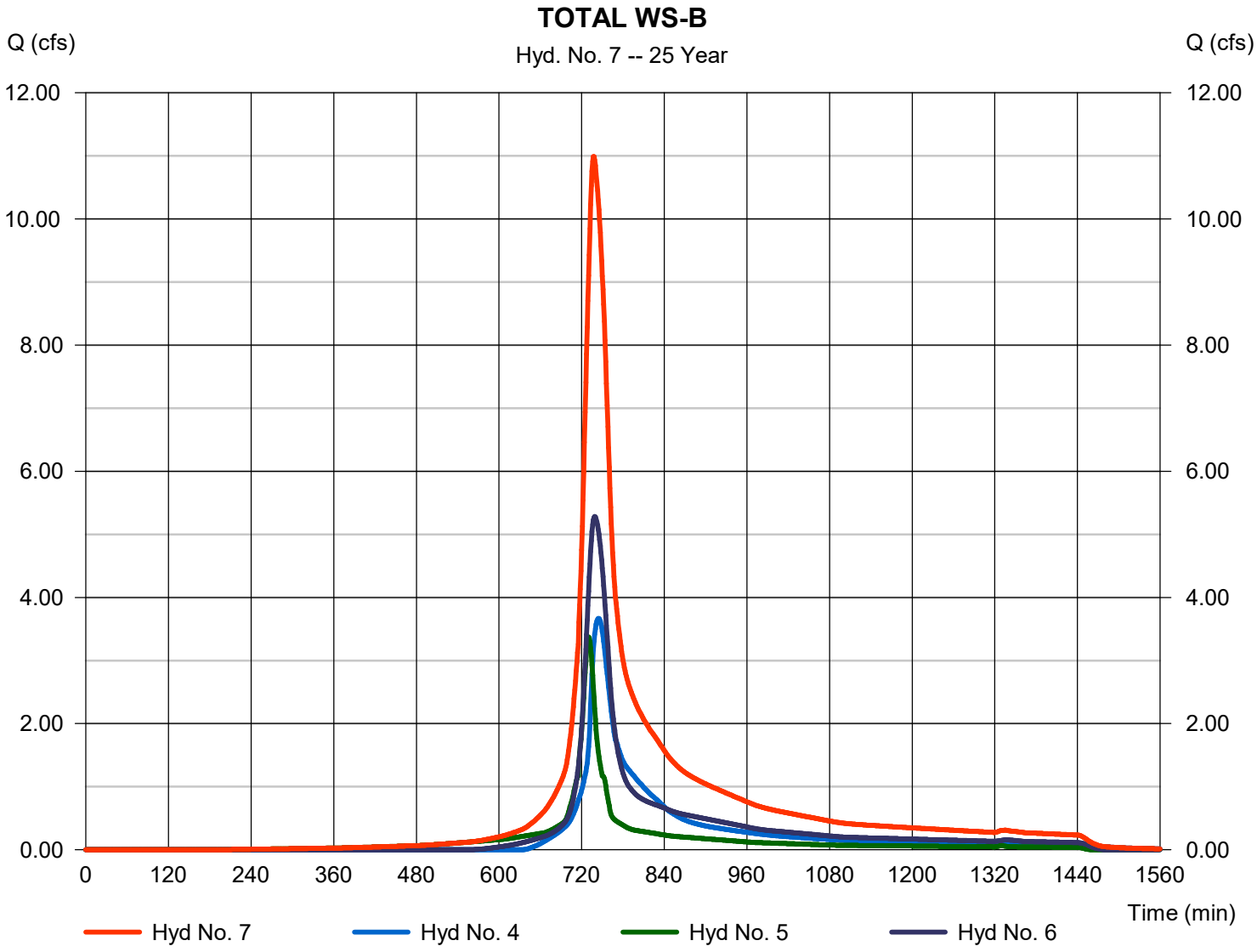


Hydrograph Report

Hyd. No. 7

TOTAL WS-B

Hydrograph type	= Combine	Peak discharge	= 10.99 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 1 min	Hyd. volume	= 61,048 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 2.470 ac

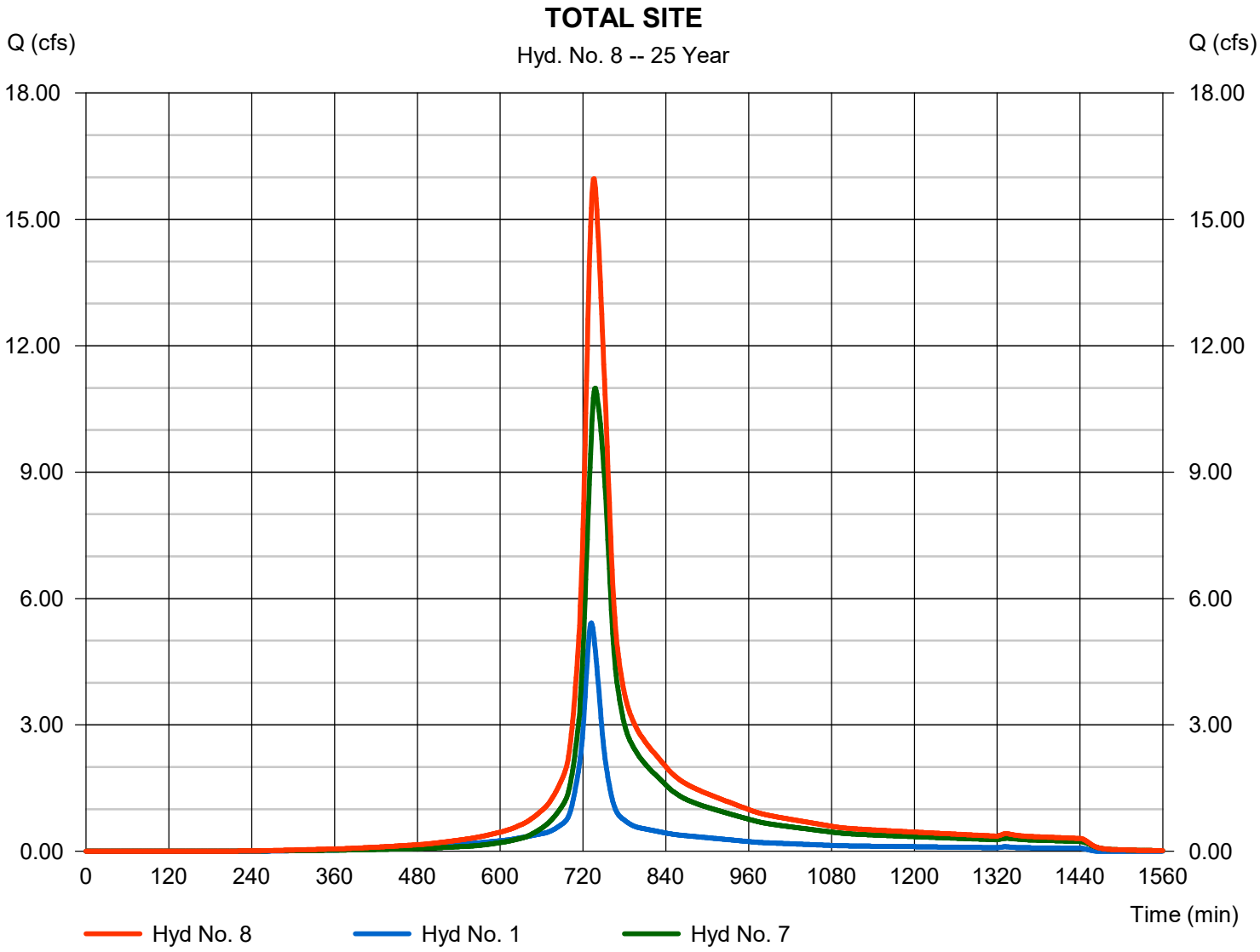


Hydrograph Report

Hyd. No. 8

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 15.97 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 84,878 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.290 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

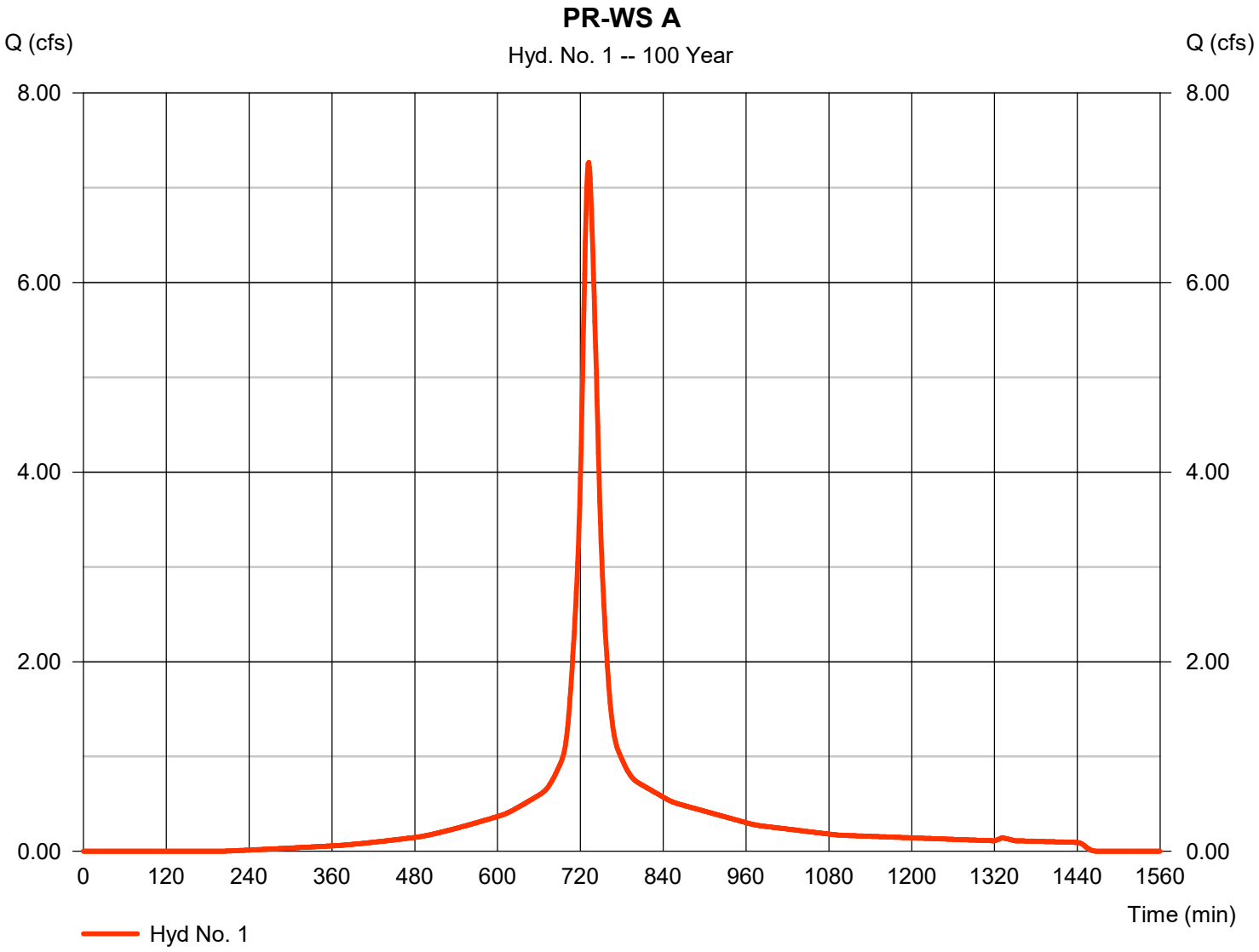
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.269	1	732	32,491	------	------	------	PR-WS A
2	SCS Runoff	6.887	1	733	30,946	------	------	------	PR-WS B1A (MC-3500)
3	SCS Runoff	4.544	1	728	18,457	------	------	------	PR-WS B1B (24IN PIPE)
4	Reservoir	4.759	1	746	29,730	2	103.34	7,311	MC 3500
5	Reservoir	4.424	1	730	18,457	3	101.08	405	24IN PIPE
6	SCS Runoff	8.163	1	739	40,716	------	------	------	PR-WS B2
7	Combine	16.04	1	736	88,902	4, 5, 6	------	------	TOTAL WS-B
8	Combine	22.97	1	734	121,393	1, 7	------	------	TOTAL SITE

Hydrograph Report

Hyd. No. 1

PR-WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.269 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	32,491 cuft
Drainage area	=	1.290 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.00 min
Total precip.	=	8.46 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

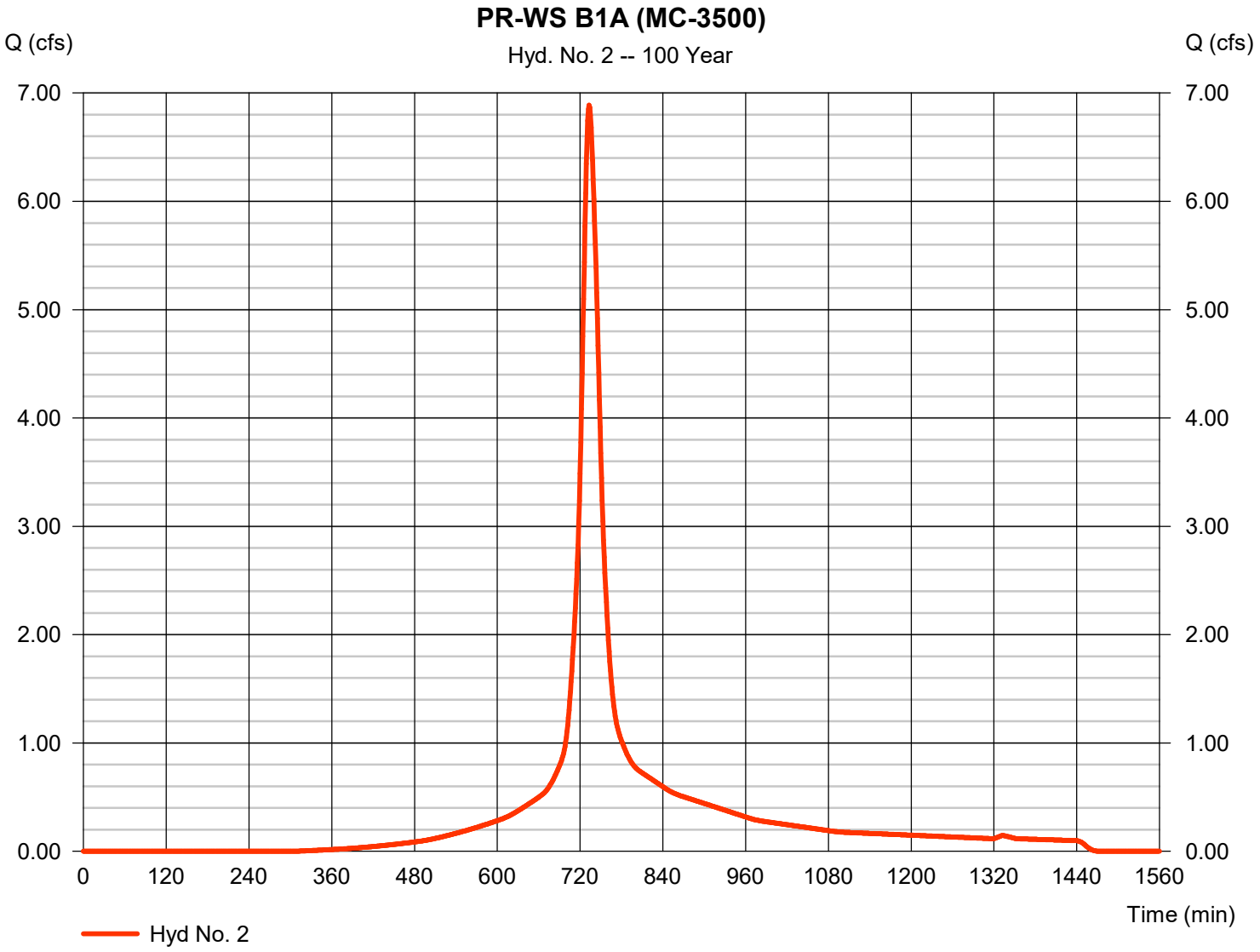


Hydrograph Report

Hyd. No. 2

PR-WS B1A (MC-3500)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.887 cfs
Storm frequency	=	100 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	30,946 cuft
Drainage area	=	1.380 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.00 min
Total precip.	=	8.46 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

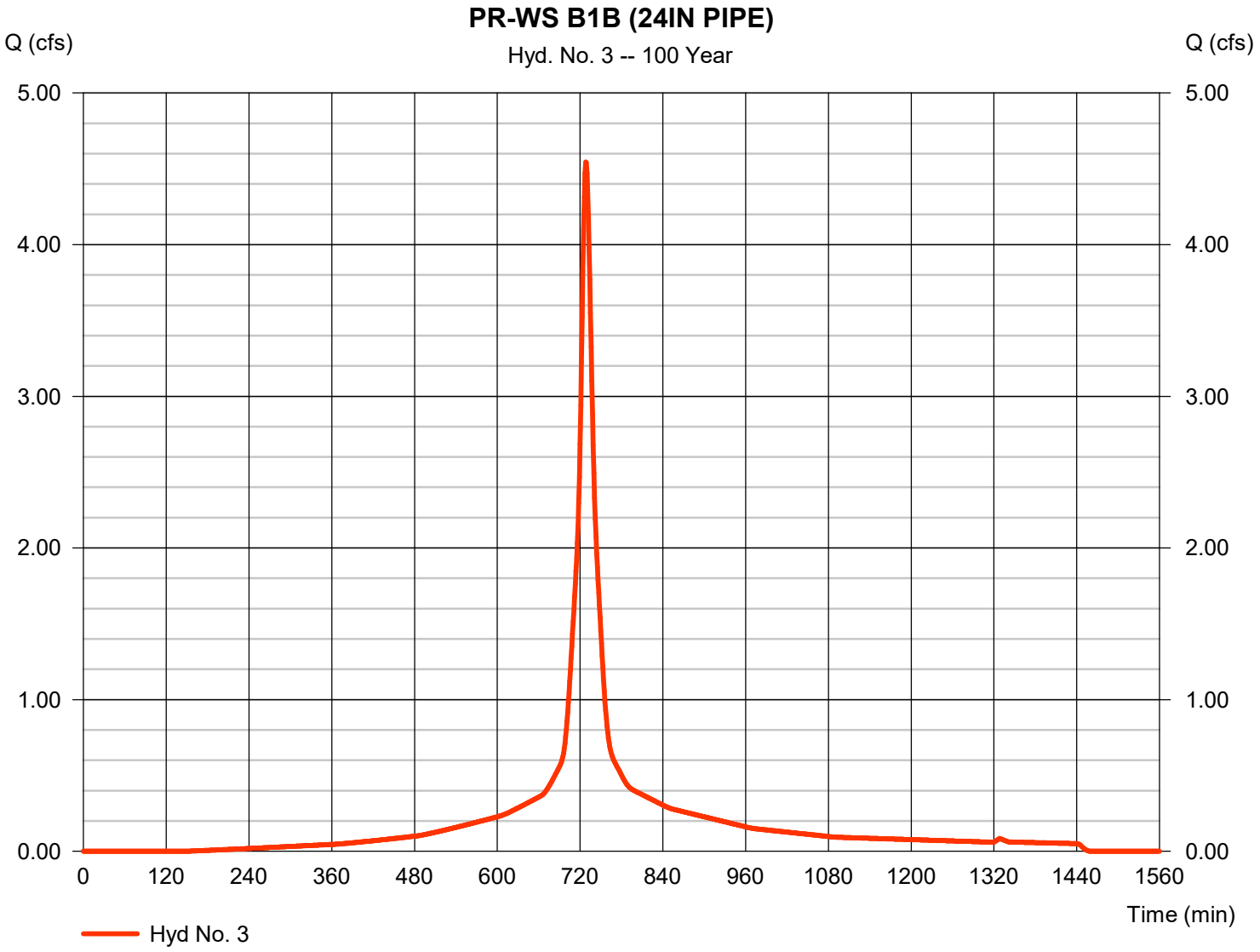


Hydrograph Report

Hyd. No. 3

PR-WS B1B (24IN PIPE)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.544 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	18,457 cuft
Drainage area	=	0.700 ac	Curve number	=	91
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	8.46 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



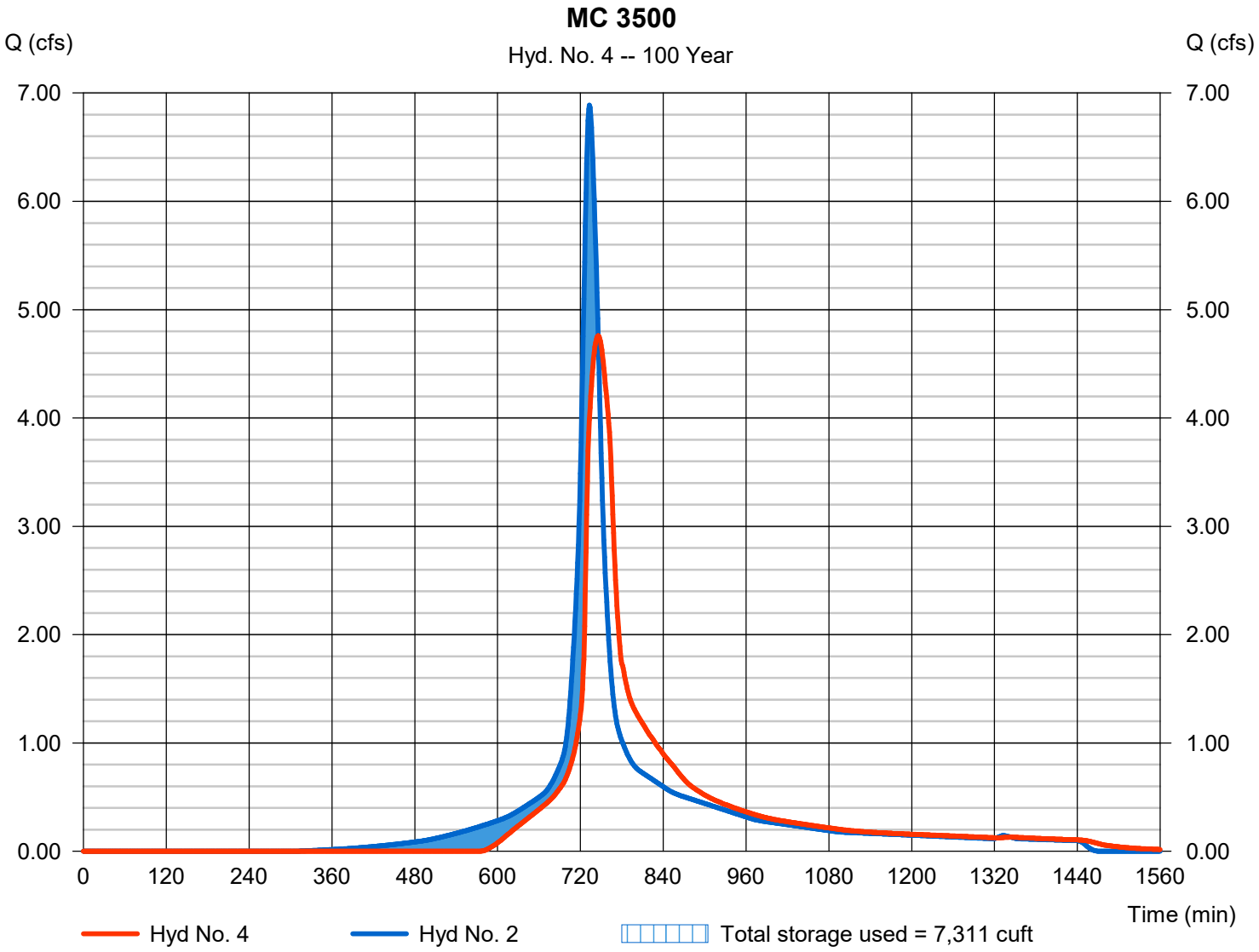
Hydrograph Report

Hyd. No. 4

MC 3500

Hydrograph type	=	Reservoir	Peak discharge	=	4.759 cfs
Storm frequency	=	100 yrs	Time to peak	=	746 min
Time interval	=	1 min	Hyd. volume	=	29,730 cuft
Inflow hyd. No.	=	2 - PR-WS B1A (MC-3500)	Max. Elevation	=	103.34 ft
Reservoir name	=	MC 3500	Max. Storage	=	7,311 cuft

Storage Indication method used.



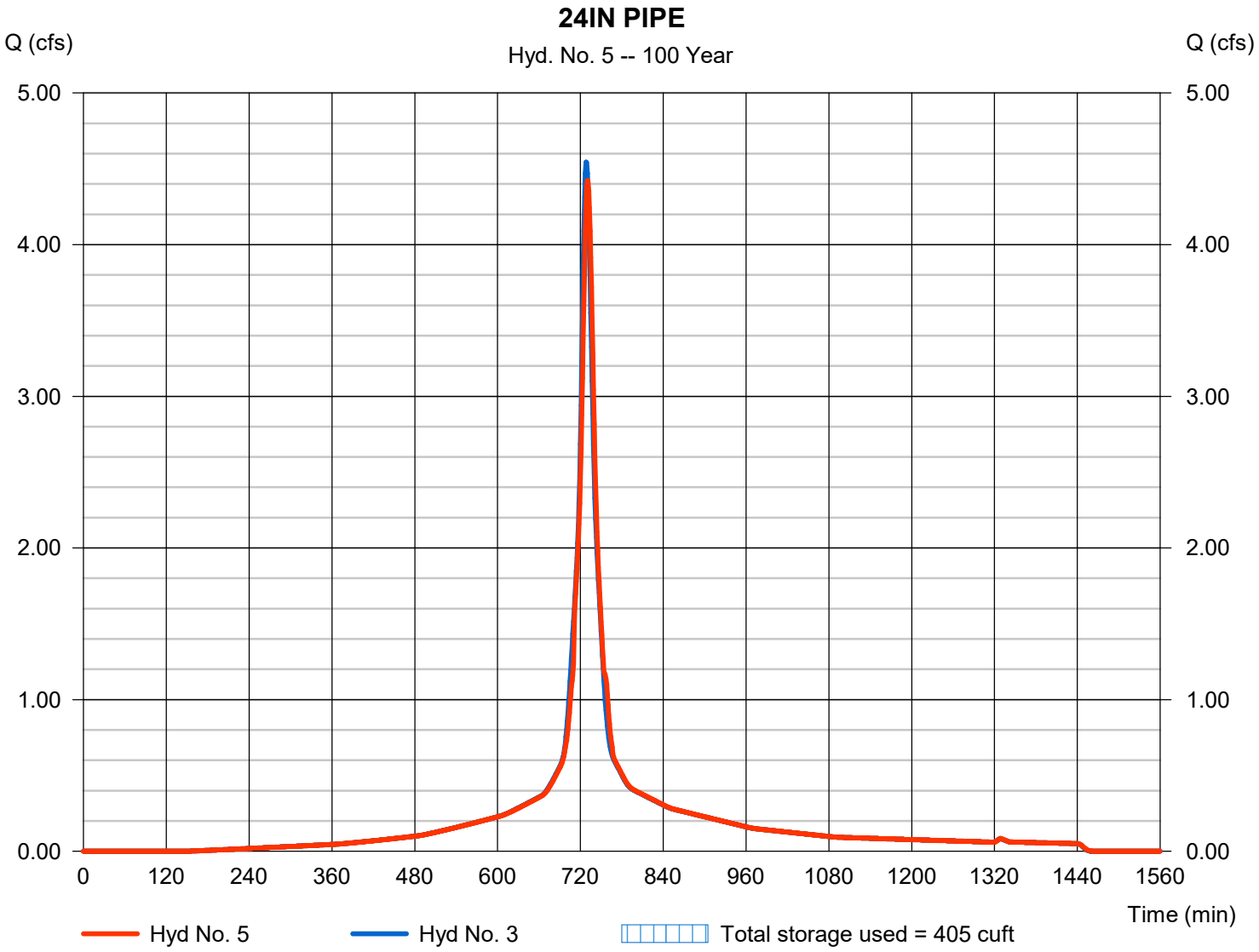
Hydrograph Report

Hyd. No. 5

24IN PIPE

Hydrograph type	=	Reservoir	Peak discharge	=	4.424 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	18,457 cuft
Inflow hyd. No.	=	3 - PR-WS B1B (24IN PIPE)	Max. Elevation	=	101.08 ft
Reservoir name	=	24IN PIPE	Max. Storage	=	405 cuft

Storage Indication method used.

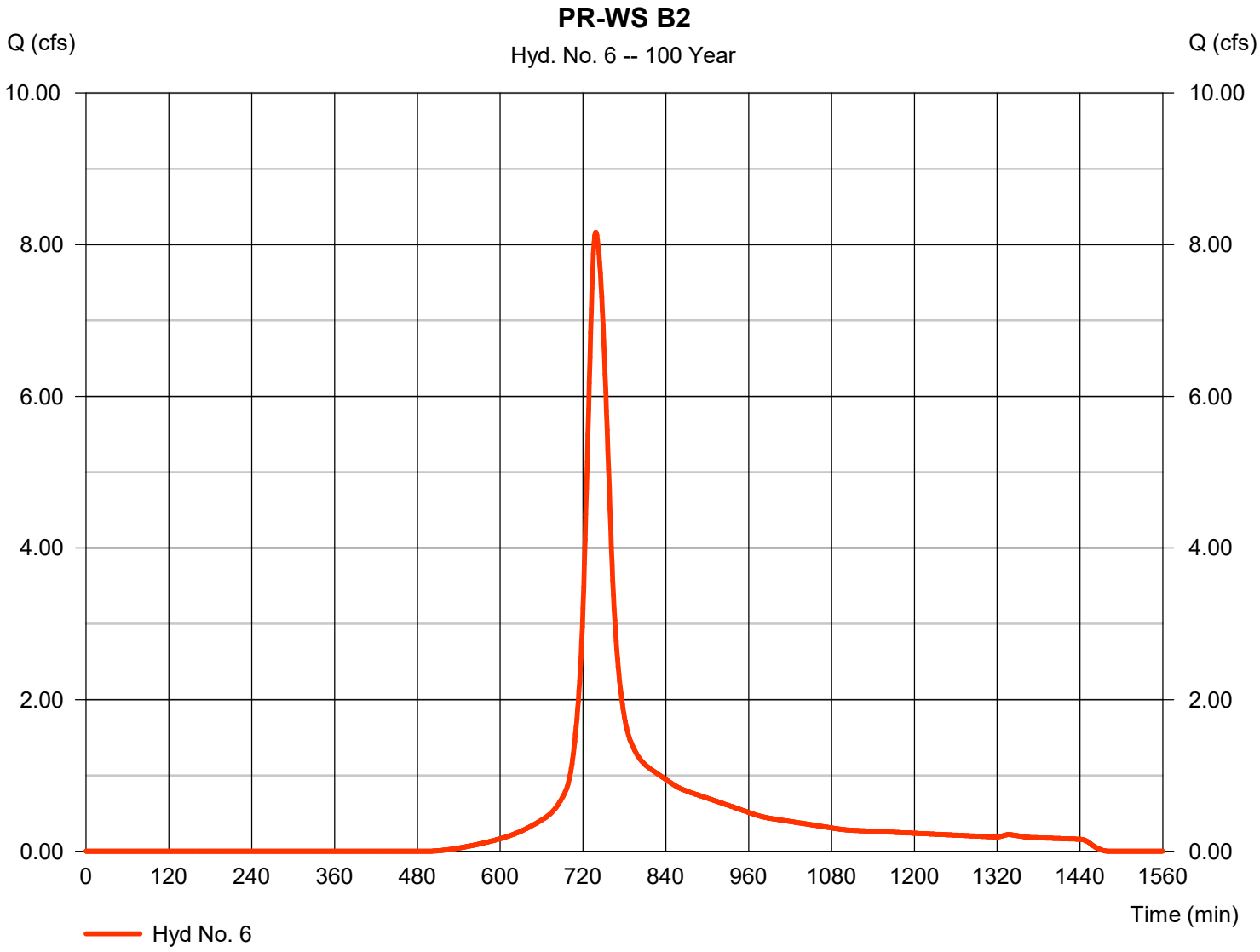


Hydrograph Report

Hyd. No. 6

PR-WS B2

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.163 cfs
Storm frequency	=	100 yrs	Time to peak	=	739 min
Time interval	=	1 min	Hyd. volume	=	40,716 cuft
Drainage area	=	2.470 ac	Curve number	=	67
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.00 min
Total precip.	=	8.46 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

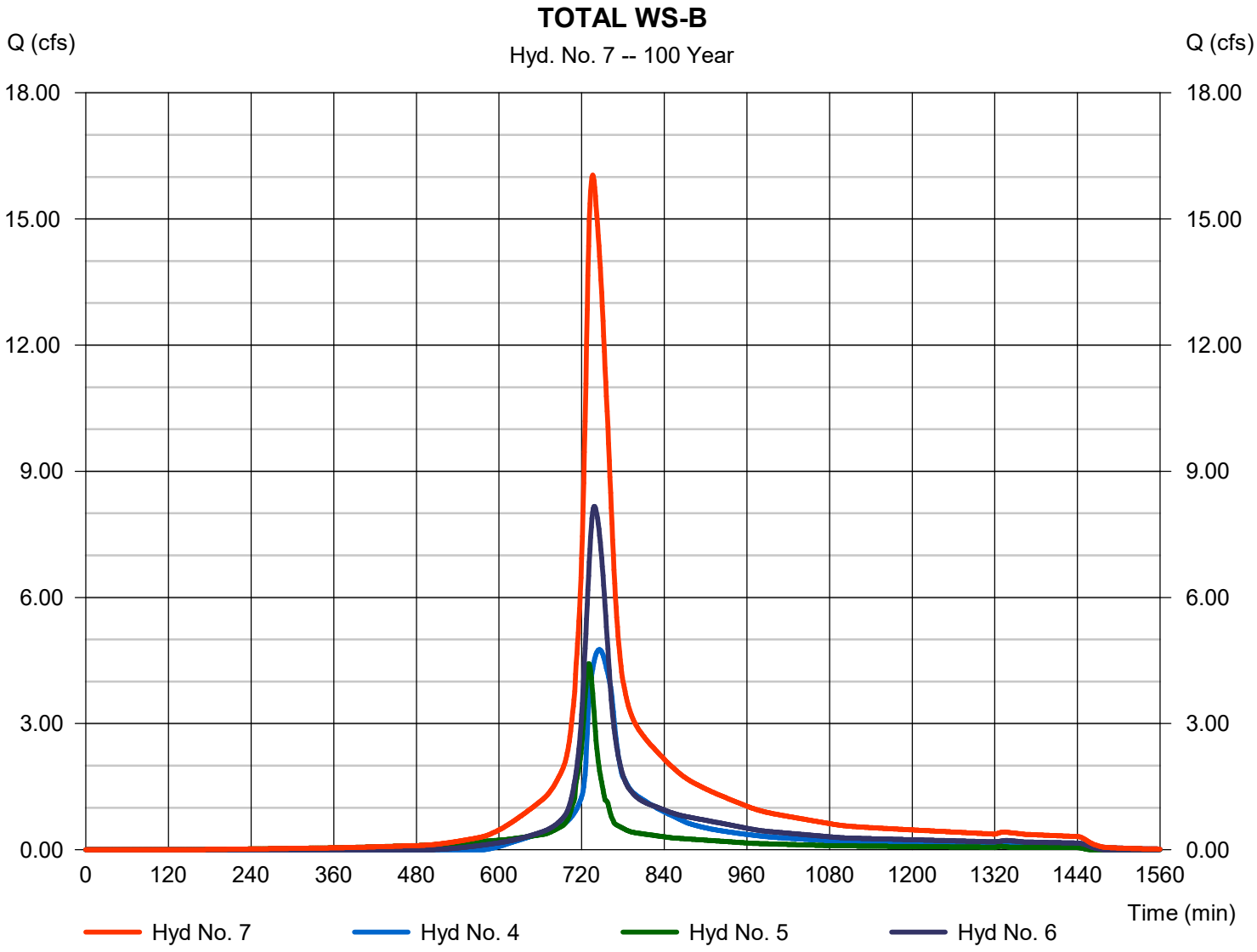


Hydrograph Report

Hyd. No. 7

TOTAL WS-B

Hydrograph type	= Combine	Peak discharge	= 16.04 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 88,902 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 2.470 ac

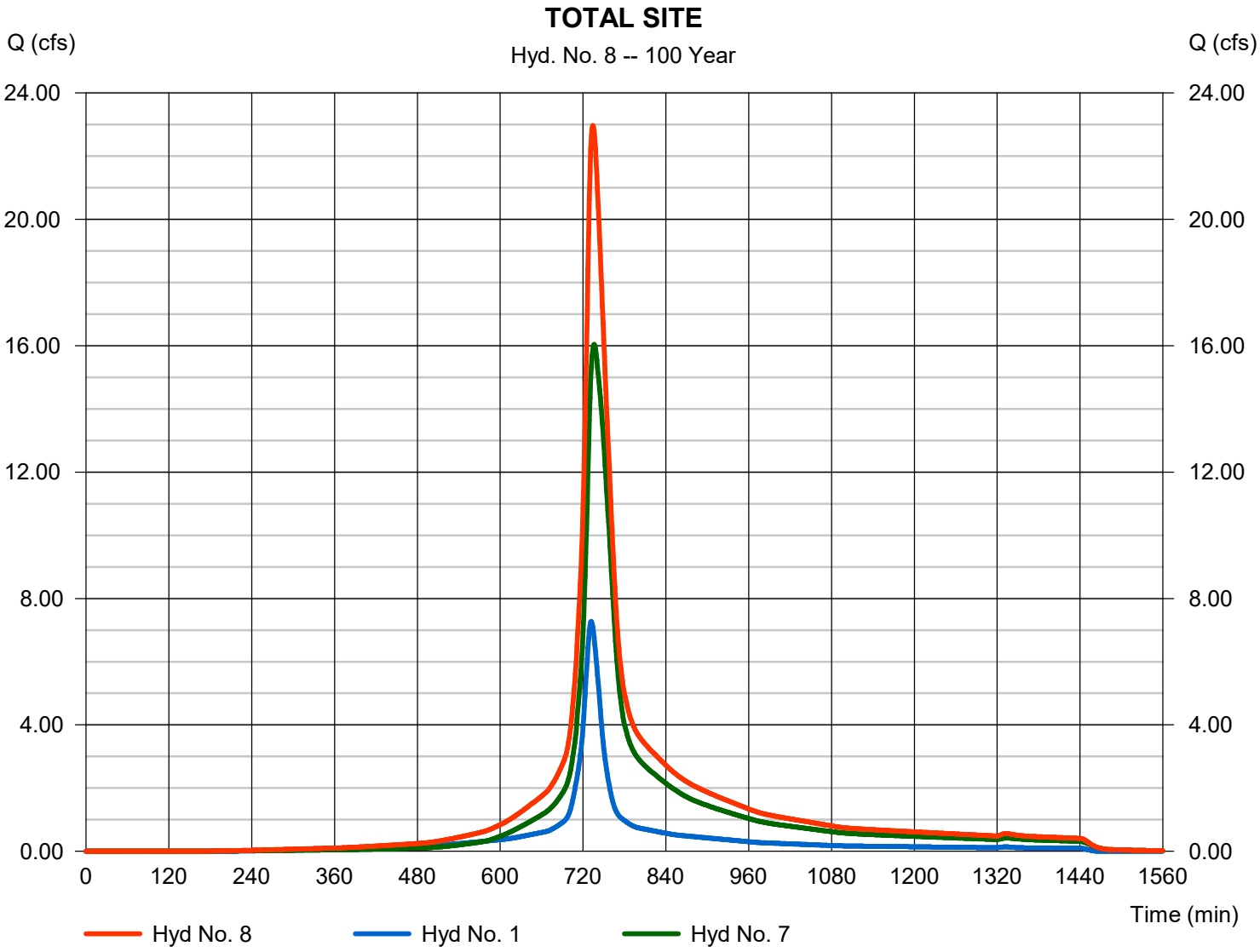


Hydrograph Report

Hyd. No. 8

TOTAL SITE

Hydrograph type	=	Combine	Peak discharge	=	22.97 cfs
Storm frequency	=	100 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	121,393 cuft
Inflow hyds.	=	1, 7	Contrib. drain. area	=	1.290 ac



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 07 / 26 / 2019

Pond No. 2 - MC 3500

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 62.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 99.25 ft, Width = 7.80 ft, Height = 5.25 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	99.25	n/a	0	0
0.52	99.78	n/a	509	509
1.05	100.30	n/a	867	1,375
1.58	100.82	n/a	1,129	2,504
2.10	101.35	n/a	1,109	3,613
2.63	101.88	n/a	1,075	4,688
3.15	102.40	n/a	1,023	5,711
3.67	102.93	n/a	949	6,660
4.20	103.45	n/a	836	7,496
4.72	103.97	n/a	603	8,099
5.25	104.50	n/a	509	8,607

Culvert / Orifice Structures

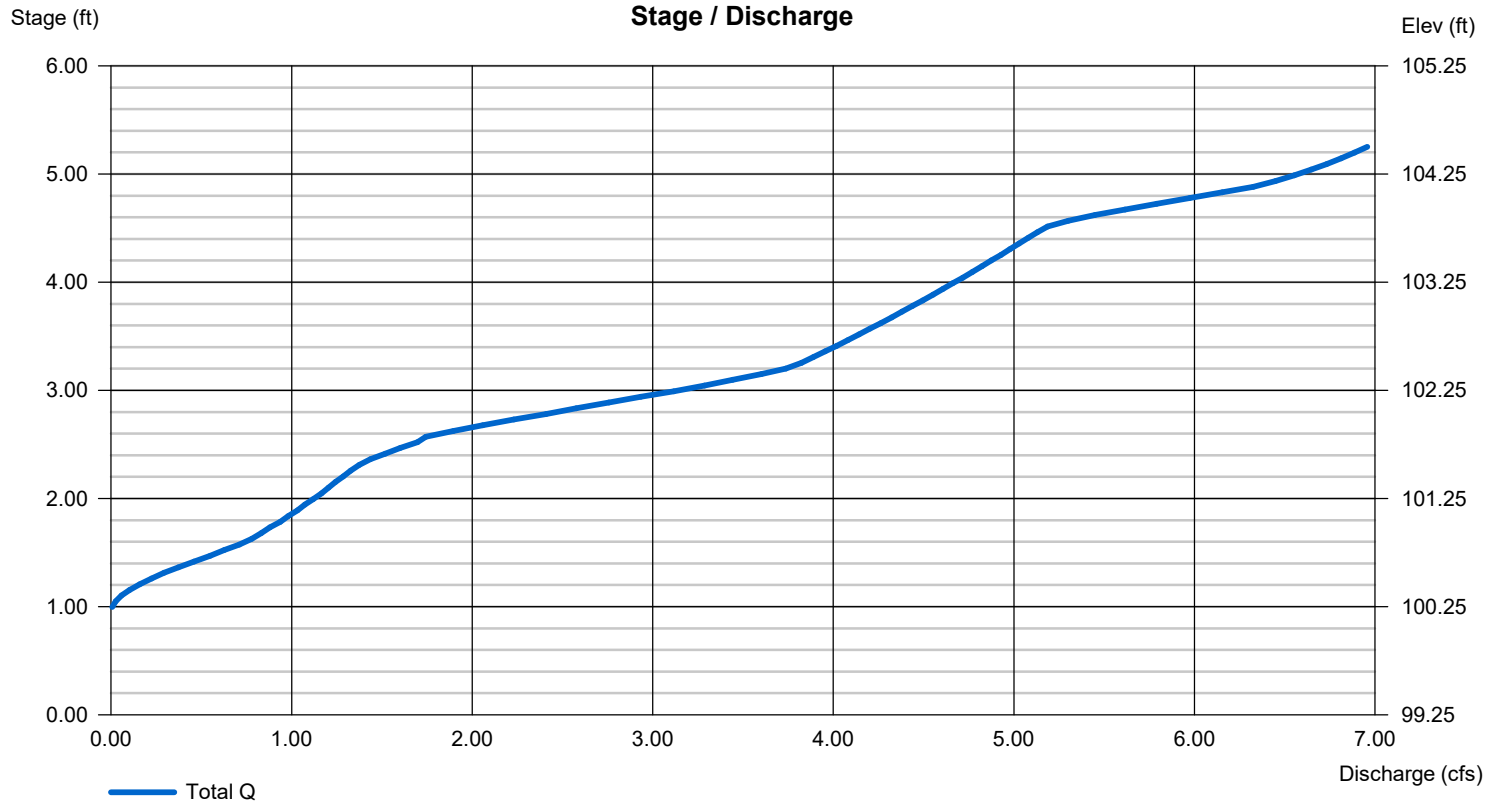
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	8.00	12.00	0.00
Span (in)	= 12.00	8.00	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.20	100.20	101.50	0.00
Length (ft)	= 41.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 103.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 07 / 26 / 2019

Pond No. 3 - 24IN PIPE

Pond Data

UG Chambers -Invert elev. = 99.20 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 169.00 ft, No. Barrels = 1, Slope = 0.50%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	99.20	n/a	0	0
0.28	99.48	n/a	8	8
0.57	99.77	n/a	25	32
0.85	100.05	n/a	60	92
1.14	100.34	n/a	82	174
1.42	100.62	n/a	92	266
1.71	100.91	n/a	92	357
1.99	101.19	n/a	82	439
2.28	101.48	n/a	60	499
2.56	101.76	n/a	25	523
2.85	102.04	n/a	8	531

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	Inactive	0.00	0.00
Span (in)	= 12.00	12.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 99.20	99.20	0.00	0.00
Length (ft)	= 13.00	0.50	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

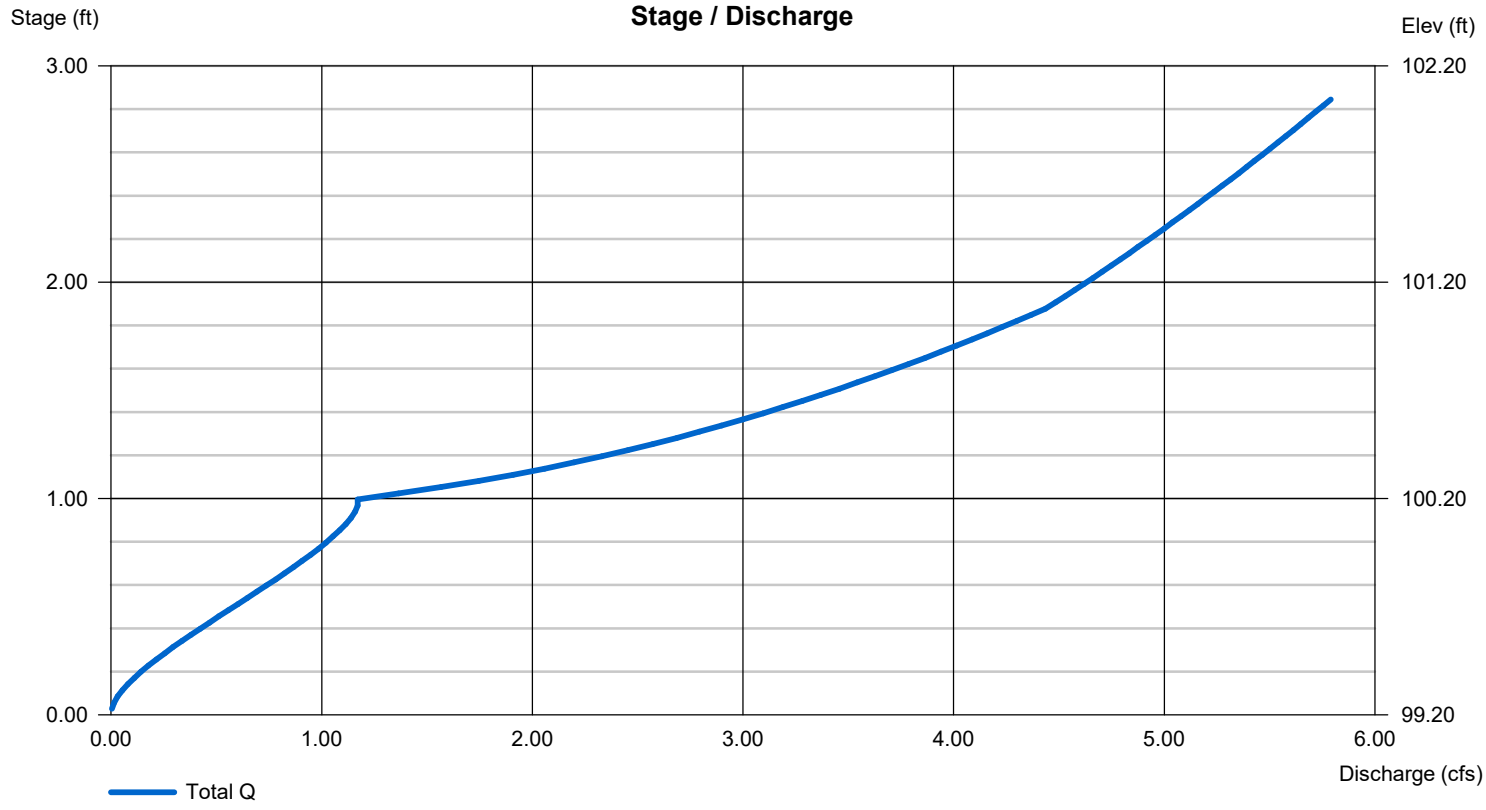
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

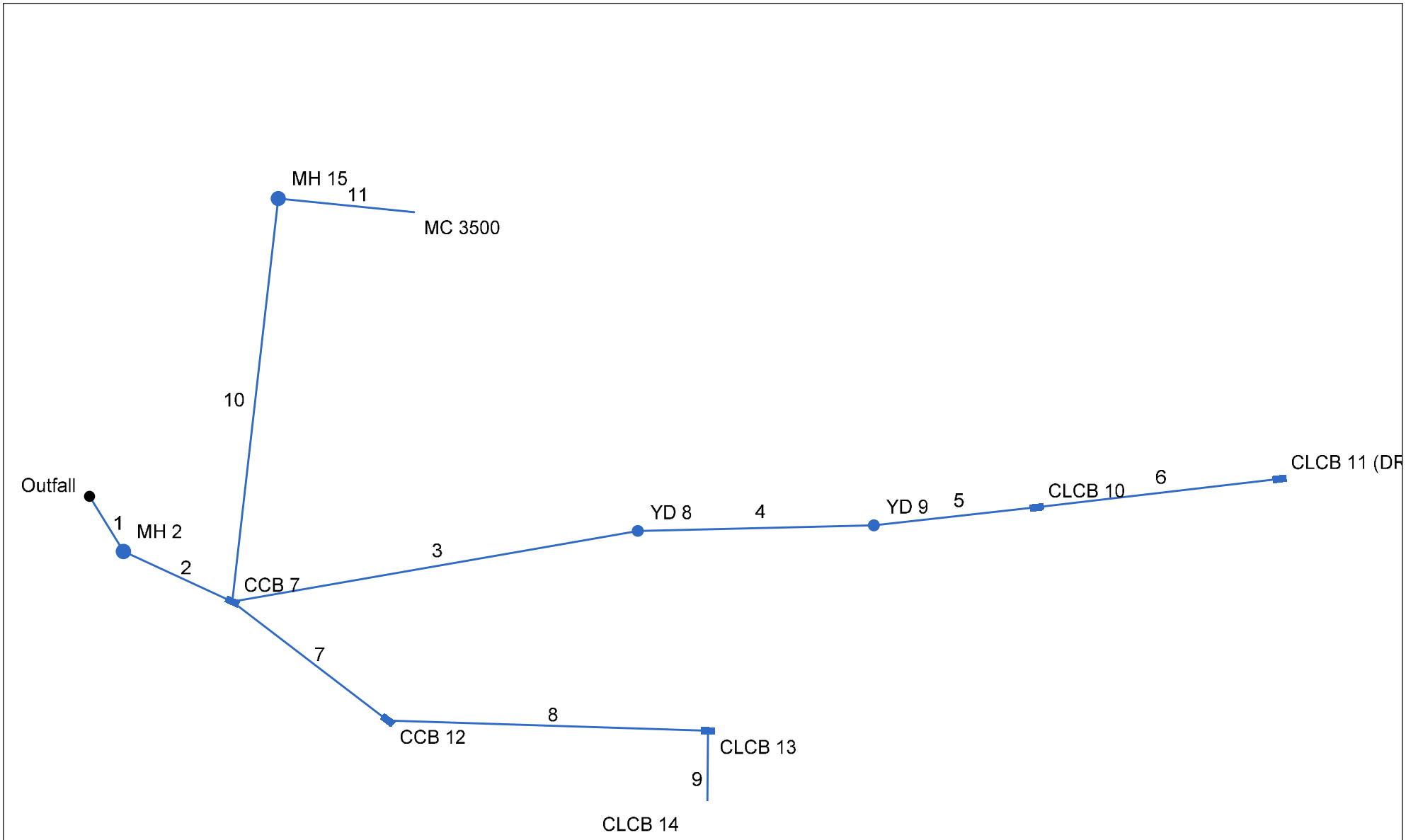
Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



APPENDIX C

Stormwater Collection System Calculations

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Storm-East.stm	Number of lines: 11	Date: 7/26/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	19.631	0.00	2.48	0.00	0.00	0.95	0.0	22.7	3.4	8.27	4.99	6.92	15	0.51	99.00	99.10	100.13	100.46	103.00	103.20	EX-MH2
2	1	36.154	0.02	2.48	0.62	0.01	0.95	5.0	22.6	3.4	5.60	4.94	4.56	15	0.50	99.09	99.27	100.89	101.12	103.20	103.00	MH2-CCB7
3	2	124.021	0.07	1.54	0.60	0.04	0.54	5.0	21.9	3.4	1.86	5.13	3.16	12	1.77	100.00	102.19	101.61	102.77	103.00	106.80	CCB7-YD8
4	3	71.142	0.12	1.47	0.40	0.05	0.50	5.0	21.6	3.5	1.74	4.73	3.75	12	1.50	102.19	103.26	102.77	103.82	106.80	106.50	YD8-YD9
5	4	49.293	0.13	1.35	0.37	0.05	0.45	12.0	21.4	3.5	1.58	4.73	3.60	12	1.50	103.26	104.00	103.82	104.53	106.50	107.00	YD9-CLCB10
6	5	73.641	1.22	1.22	0.33	0.40	0.40	21.0	21.0	3.5	1.42	10.91	3.47	12	8.00	104.00	109.89	104.53	110.39	107.00	120.50	CLCB10-CLCB11
7	2	59.114	0.22	0.92	0.48	0.11	0.39	7.0	13.6	4.6	1.80	2.70	2.29	12	0.49	99.47	99.76	101.61	101.74	103.00	102.40	CCB7-CCB12
8	7	96.497	0.53	0.70	0.38	0.20	0.29	13.0	13.0	4.7	1.35	7.38	2.62	12	3.66	99.76	103.29	101.82	103.78	102.40	106.30	CCB12-CLCB13
9	8	23.509	0.17	0.17	0.51	0.09	0.09	9.0	9.0	5.7	0.50	2.76	2.54	12	0.51	103.48	103.60	103.78	103.89	106.30	106.60	CLCB13-CLCB14
10	2	123.249	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	2.39	2.74	3.04	12	0.50	99.31	99.93	101.61	102.08	103.00	104.00	CCB7-MH15
11	10	41.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.39	2.69	3.04	12	0.49	100.00	100.20	102.23	102.38	104.00	105.00	MH15-MC3500

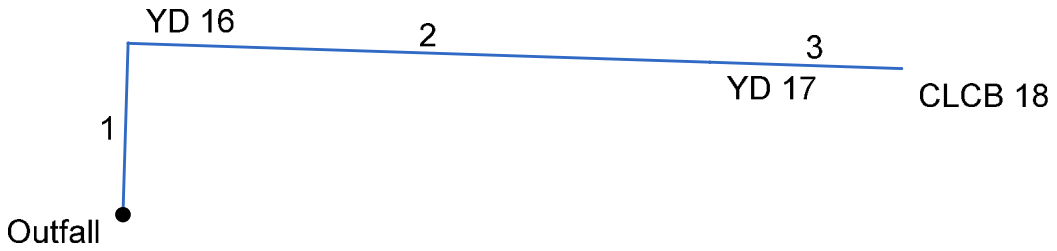
Project File: Storm-East.stm

Number of lines: 11

Run Date: 7/26/2019

NOTES:Intensity = 35.55 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Storm-North.stm	Number of lines: 3	Date: 7/25/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10.116	0.07	0.81	0.42	0.03	0.26	6.0	18.2	3.9	1.01	0.92	3.52	8	0.49	103.58	103.63	104.06	104.19	104.33	106.30	EX-YD 16
2	1	34.610	0.04	0.74	0.58	0.02	0.23	8.0	18.1	3.9	0.90	2.22	3.10	8	2.89	103.63	104.63	104.43	105.08	106.30	107.30	YD16-YD17
3	2	11.349	0.70	0.70	0.30	0.21	0.21	18.0	18.0	3.9	0.82	1.86	3.35	8	2.03	104.63	104.86	105.08	105.29	107.30	111.70	YD17-CLCB18

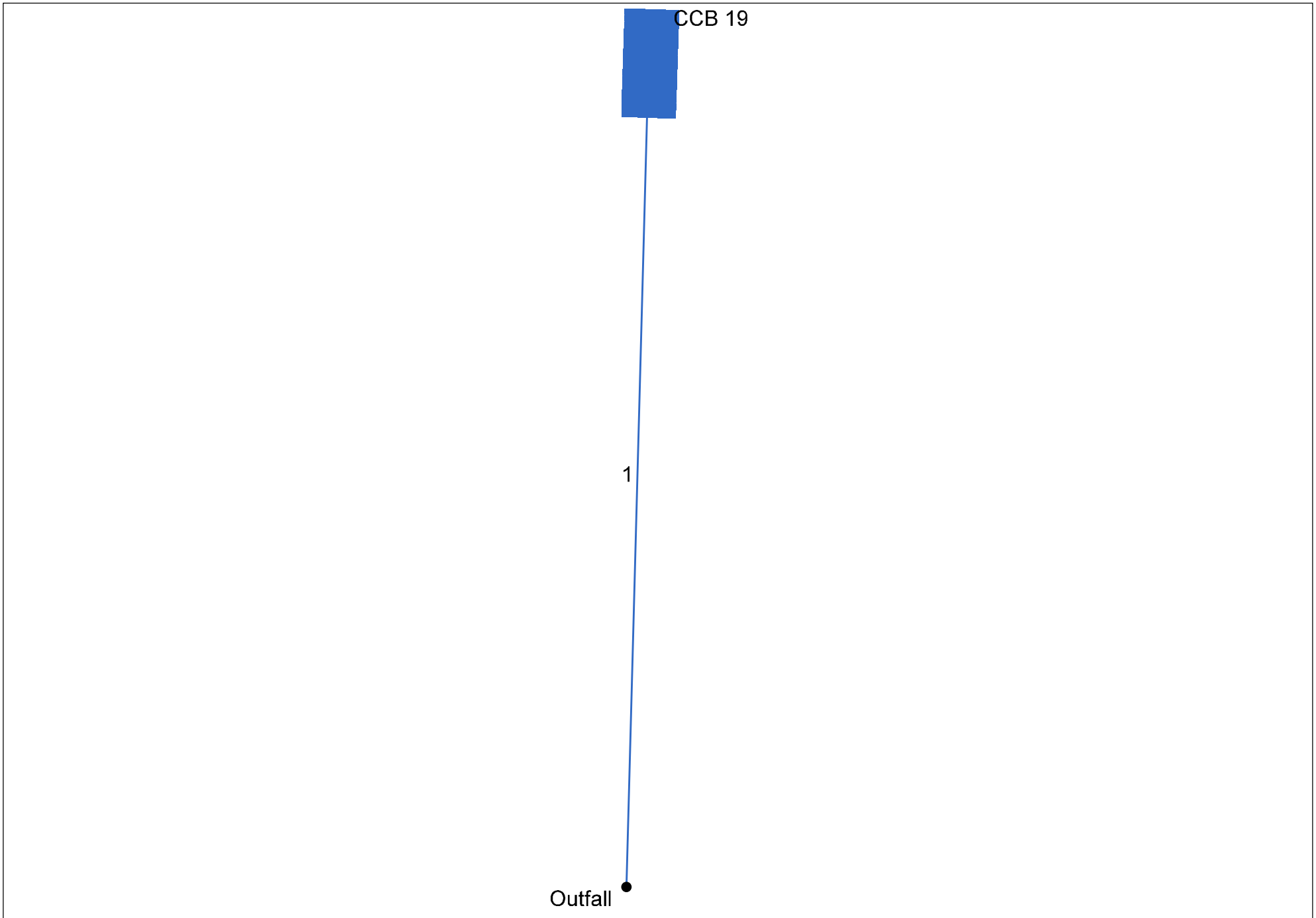
Project File: Storm-North.stm

Number of lines: 3

Run Date: 7/25/2019

NOTES:Intensity = 35.55 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Storm-Northwest.stm	Number of lines: 1	Date: 7/25/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	30.534	0.57	0.57	0.43	0.25	0.25	18.0	18.0	3.9	0.95	2.70	3.14	12	0.49	101.05	101.20	101.46	101.61	104.40	104.50	EX-CCB19

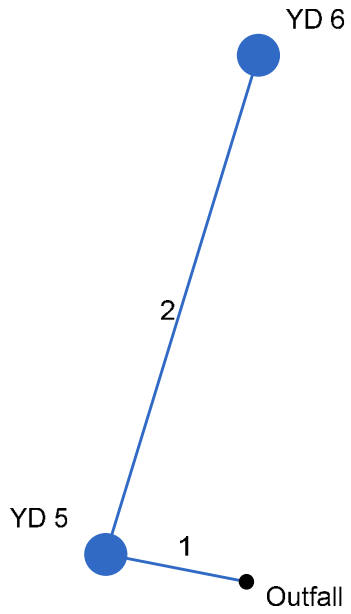
Project File: Storm-Northwest.stm

Number of lines: 1

Run Date: 7/25/2019

NOTES:Intensity = 35.55 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Storm-Into 24in Pipe.stm	Number of lines: 2	Date: 7/26/2019

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	14.377	0.02	0.07	0.51	0.01	0.06	5.0	5.5	7.2	0.40	0.91	2.56	8	0.49	100.44	100.51	100.73	100.83	103.30	104.00	24IN PIPE-YD 5
2	1	63.310	0.05	0.05	0.90	0.05	0.05	5.0	5.0	7.5	0.34	0.93	1.93	8	0.51	100.51	100.83	100.96	101.10	104.00	103.50	YD5-YD6

Project File: Storm-Into 24in Pipe.stm

Number of lines: 2

Run Date: 7/26/2019

NOTES:Intensity = 35.55 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Project **USJ O'Connell Center** By **KMS** Date **7/26/2019**

Location **West Hartford, CT** Checked **KEG** Date **7/26/2019**

Circle one: Present (Developed) Job No. **140202901**

Catchment Area	Area		Impervious (C=0.9)		Gravel (C=0.6)		Pervious (C=0.3)		C
	[SF]	[AC]	[SF]	[AC]	[SF]	[AC]	[SF]	[AC]	
CCB 3	16172	0.37	11008	0.25	1037	0.02	4127	0.09	0.73
CCB 4	11283	0.26	7467	0.17	748	0.02	3068	0.07	0.72
YD 5	855	0.02	299	0.01	0	0.00	556	0.01	0.51
YD 6	2077	0.05	2072	0.05	0	0.00	5	0.00	0.90
CCB 7	872	0.02	467	0.01	0	0.00	405	0.01	0.62
YD 8	3197	0.07	1614	0.04	0	0.00	1583	0.04	0.60
YD 9	5070	0.12	862	0.02	0	0.00	4208	0.10	0.40
CLCB 10	5709	0.13	665	0.02	0	0.00	5044	0.12	0.37
CLCB 11	52999	1.22	2215	0.05	0	0.00	50784	1.17	0.33
CCB 12	9530	0.22	2797	0.06	0	0.00	6733	0.15	0.48
CLCB 13	22869	0.53	3069	0.07	0	0.00	19800	0.45	0.38
CLCB 14	7598	0.17	2674	0.06	0	0.00	4924	0.11	0.51
YD 16	3119	0.07	616	0.01	0	0.00	2503	0.06	0.42
YD 17	1777	0.04	834	0.02	0	0.00	943	0.02	0.58
CLCB 18	30393	0.70	0	0.00	0	0.00	30393	0.70	0.30
CLCB 19	24965	0.57	5512	0.13	0	0.00	19453	0.45	0.43

APPENDIX D

NOAA Rainfall Data

NOAA Atlas 14, Volume 10, Version 3 WEST HARTFORD
Station ID: 06-9162
Location name: Town of West Hartford, Connecticut, USA*
Latitude: 41.75°, Longitude: -72.7833°
Elevation:
Elevation (station metadata): 275 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.343 (0.265-0.443)	0.414 (0.319-0.535)	0.530 (0.407-0.688)	0.625 (0.478-0.817)	0.757 (0.562-1.04)	0.857 (0.623-1.20)	0.961 (0.680-1.40)	1.08 (0.724-1.61)	1.25 (0.806-1.93)	1.38 (0.874-2.18)
10-min	0.486 (0.375-0.628)	0.586 (0.452-0.758)	0.750 (0.576-0.974)	0.886 (0.677-1.16)	1.07 (0.796-1.47)	1.21 (0.883-1.70)	1.36 (0.963-1.98)	1.53 (1.03-2.28)	1.76 (1.14-2.73)	1.96 (1.24-3.09)
15-min	0.571 (0.441-0.738)	0.689 (0.532-0.892)	0.882 (0.678-1.15)	1.04 (0.797-1.36)	1.26 (0.936-1.73)	1.43 (1.04-2.00)	1.60 (1.13-2.33)	1.80 (1.21-2.68)	2.07 (1.34-3.21)	2.30 (1.46-3.64)
30-min	0.773 (0.597-0.999)	0.933 (0.720-1.21)	1.20 (0.918-1.55)	1.41 (1.08-1.85)	1.71 (1.27-2.34)	1.94 (1.41-2.71)	2.17 (1.54-3.16)	2.44 (1.64-3.64)	2.82 (1.82-4.36)	3.13 (1.98-4.94)
60-min	0.975 (0.753-1.26)	1.18 (0.908-1.52)	1.51 (1.16-1.96)	1.79 (1.36-2.33)	2.16 (1.60-2.96)	2.45 (1.78-3.43)	2.75 (1.94-3.99)	3.08 (2.07-4.59)	3.56 (2.30-5.50)	3.95 (2.50-6.24)
2-hr	1.26 (0.979-1.62)	1.52 (1.18-1.95)	1.94 (1.50-2.50)	2.29 (1.76-2.97)	2.77 (2.07-3.78)	3.13 (2.30-4.38)	3.51 (2.51-5.13)	3.97 (2.67-5.89)	4.64 (3.02-7.16)	5.22 (3.31-8.21)
3-hr	1.45 (1.13-1.86)	1.75 (1.37-2.24)	2.24 (1.74-2.88)	2.65 (2.04-3.43)	3.21 (2.41-4.37)	3.62 (2.67-5.06)	4.07 (2.93-5.94)	4.61 (3.11-6.83)	5.43 (3.53-8.36)	6.14 (3.91-9.65)
6-hr	1.83 (1.44-2.33)	2.23 (1.75-2.83)	2.87 (2.24-3.66)	3.40 (2.64-4.36)	4.13 (3.12-5.60)	4.67 (3.46-6.50)	5.25 (3.81-7.67)	5.98 (4.05-8.83)	7.11 (4.64-10.9)	8.08 (5.16-12.7)
12-hr	2.26 (1.79-2.85)	2.77 (2.19-3.51)	3.62 (2.85-4.59)	4.32 (3.38-5.51)	5.28 (4.02-7.14)	5.99 (4.47-8.31)	6.77 (4.94-9.86)	7.74 (5.26-11.4)	9.25 (6.05-14.1)	10.6 (6.76-16.5)
24-hr	2.64 (2.10-3.31)	3.30 (2.63-4.15)	4.39 (3.48-5.54)	5.30 (4.17-6.72)	6.54 (5.01-8.82)	7.45 (5.61-10.3)	8.46 (6.24-12.4)	9.76 (6.66-14.3)	11.9 (7.78-18.1)	13.7 (8.80-21.3)
2-day	2.94 (2.36-3.66)	3.77 (3.02-4.70)	5.12 (4.08-6.41)	6.24 (4.95-7.87)	7.79 (6.02-10.5)	8.90 (6.78-12.4)	10.2 (7.61-15.0)	11.9 (8.13-17.4)	14.8 (9.71-22.4)	17.3 (11.2-26.9)
3-day	3.20 (2.57-3.96)	4.11 (3.30-5.10)	5.60 (4.48-6.98)	6.84 (5.44-8.58)	8.54 (6.63-11.5)	9.77 (7.47-13.6)	11.2 (8.40-16.4)	13.1 (8.98-19.1)	16.3 (10.8-24.8)	19.3 (12.4-29.8)
4-day	3.43 (2.77-4.24)	4.40 (3.55-5.45)	5.99 (4.81-7.45)	7.31 (5.83-9.15)	9.12 (7.10-12.2)	10.4 (7.99-14.4)	11.9 (8.98-17.5)	14.0 (9.59-20.3)	17.4 (11.5-26.4)	20.6 (13.3-31.8)
7-day	4.09 (3.32-5.03)	5.18 (4.19-6.38)	6.95 (5.61-8.60)	8.42 (6.75-10.5)	10.4 (8.16-13.9)	11.9 (9.15-16.4)	13.6 (10.2-19.8)	15.8 (10.9-22.9)	19.5 (12.9-29.5)	22.9 (14.8-35.3)
10-day	4.76 (3.88-5.84)	5.91 (4.80-7.25)	7.77 (6.29-9.58)	9.32 (7.50-11.6)	11.5 (8.96-15.2)	13.0 (10.00-17.8)	14.7 (11.1-21.3)	17.0 (11.8-24.7)	20.8 (13.8-31.4)	24.2 (15.7-37.2)
20-day	6.88 (5.64-8.38)	8.08 (6.61-9.85)	10.0 (8.18-12.3)	11.7 (9.45-14.4)	13.9 (10.9-18.2)	15.5 (12.0-20.9)	17.4 (13.0-24.5)	19.6 (13.6-28.2)	23.1 (15.4-34.7)	26.2 (17.0-40.2)
30-day	8.67 (7.13-10.5)	9.89 (8.12-12.0)	11.9 (9.73-14.5)	13.5 (11.0-16.6)	15.8 (12.4-20.5)	17.5 (13.5-23.3)	19.3 (14.4-27.0)	21.5 (15.0-30.8)	24.7 (16.5-36.9)	27.4 (17.8-41.9)
45-day	10.9 (8.98-13.1)	12.1 (10.0-14.7)	14.2 (11.7-17.2)	15.9 (13.0-19.5)	18.3 (14.4-23.4)	20.1 (15.4-26.4)	21.9 (16.2-30.1)	23.9 (16.8-34.1)	26.7 (17.9-39.7)	28.9 (18.8-44.1)
60-day	12.7 (10.5-15.3)	14.0 (11.6-16.9)	16.2 (13.3-19.6)	18.0 (14.7-21.9)	20.4 (16.1-26.0)	22.3 (17.1-29.1)	24.2 (17.8-32.8)	26.1 (18.3-37.0)	28.5 (19.2-42.2)	30.2 (19.8-46.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

NOAA Atlas 14, Volume 10, Version 3
Location name: Town of West Hartford, Connecticut, USA*
Latitude: 41.75°, Longitude: -72.7833°
Elevation: 286.75 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.12** (3.18-5.32)	**4.97** (3.83-6.42)	**6.36** (4.88-8.26)	**7.50** (5.74-9.80)	**9.08** (6.74-12.4)	**10.3** (7.48-14.4)	**11.5** (8.16-16.8)	**12.9** (8.69-19.3)	**14.9** (9.67-23.1)	**16.6** (10.5-26.2)
10-min	**2.92** (2.25-3.77)	**3.52** (2.71-4.55)	**4.50** (3.46-5.84)	**5.32** (4.06-6.94)	**6.44** (4.78-8.81)	**7.28** (5.30-10.2)	**8.17** (5.78-11.9)	**9.16** (6.16-13.7)	**10.6** (6.85-16.4)	**11.7** (7.43-18.5)
15-min	**2.28** (1.76-2.95)	**2.76** (2.13-3.57)	**3.53** (2.71-4.58)	**4.17** (3.19-5.45)	**5.05** (3.74-6.91)	**5.71** (4.15-8.00)	**6.41** (4.53-9.32)	**7.18** (4.83-10.7)	**8.30** (5.37-12.8)	**9.20** (5.82-14.5)
30-min	**1.55** (1.19-2.00)	**1.87** (1.44-2.42)	**2.39** (1.84-3.10)	**2.83** (2.16-3.69)	**3.43** (2.54-4.69)	**3.88** (2.82-5.42)	**4.35** (3.08-6.32)	**4.88** (3.28-7.27)	**5.63** (3.65-8.71)	**6.25** (3.96-9.87)
60-min	**0.975** (0.753-1.26)	**1.18** (0.908-1.52)	**1.51** (1.16-1.96)	**1.79** (1.36-2.33)	**2.16** (1.60-2.96)	**2.45** (1.78-3.43)	**2.75** (1.94-3.99)	**3.08** (2.07-4.59)	**3.56** (2.30-5.50)	**3.95** (2.50-6.24)
2-hr	**0.630** (0.490-0.808)	**0.759** (0.589-0.976)	**0.970** (0.750-1.25)	**1.14** (0.880-1.49)	**1.39** (1.04-1.89)	**1.56** (1.15-2.19)	**1.76** (1.26-2.56)	**1.98** (1.34-2.95)	**2.32** (1.51-3.58)	**2.61** (1.66-4.11)
3-hr	**0.484** (0.378-0.619)	**0.584** (0.455-0.747)	**0.747** (0.580-0.959)	**0.882** (0.681-1.14)	**1.07** (0.802-1.45)	**1.21** (0.889-1.68)	**1.35** (0.975-1.98)	**1.54** (1.04-2.28)	**1.81** (1.18-2.78)	**2.05** (1.30-3.21)
6-hr	**0.306** (0.240-0.389)	**0.372** (0.291-0.473)	**0.478** (0.374-0.611)	**0.567** (0.441-0.728)	**0.689** (0.521-0.935)	**0.779** (0.578-1.09)	**0.877** (0.636-1.28)	**0.999** (0.677-1.48)	**1.19** (0.774-1.82)	**1.35** (0.861-2.12)
12-hr	**0.187** (0.148-0.237)	**0.230** (0.182-0.291)	**0.300** (0.236-0.381)	**0.358** (0.280-0.457)	**0.438** (0.333-0.592)	**0.497** (0.371-0.690)	**0.562** (0.410-0.818)	**0.642** (0.437-0.945)	**0.768** (0.502-1.17)	**0.877** (0.561-1.37)
24-hr	**0.110** (0.087-0.138)	**0.138** (0.109-0.173)	**0.183** (0.145-0.231)	**0.221** (0.174-0.280)	**0.273** (0.209-0.367)	**0.310** (0.234-0.431)	**0.353** (0.260-0.515)	**0.407** (0.278-0.597)	**0.494** (0.324-0.753)	**0.571** (0.367-0.889)
2-day	**0.061** (0.049-0.076)	**0.079** (0.063-0.098)	**0.107** (0.085-0.134)	**0.130** (0.103-0.164)	**0.162** (0.125-0.219)	**0.185** (0.141-0.258)	**0.212** (0.158-0.312)	**0.248** (0.169-0.362)	**0.307** (0.202-0.467)	**0.361** (0.233-0.560)
3-day	**0.044** (0.036-0.055)	**0.057** (0.046-0.071)	**0.078** (0.062-0.097)	**0.095** (0.076-0.119)	**0.119** (0.092-0.159)	**0.136** (0.104-0.188)	**0.155** (0.117-0.228)	**0.182** (0.125-0.265)	**0.227** (0.150-0.344)	**0.268** (0.173-0.414)
4-day	**0.036** (0.029-0.044)	**0.046** (0.037-0.057)	**0.062** (0.050-0.078)	**0.076** (0.061-0.095)	**0.095** (0.074-0.127)	**0.109** (0.083-0.150)	**0.124** (0.094-0.182)	**0.145** (0.100-0.212)	**0.181** (0.120-0.275)	**0.214** (0.138-0.331)
7-day	**0.024** (0.020-0.030)	**0.031** (0.025-0.038)	**0.041** (0.033-0.051)	**0.050** (0.040-0.062)	**0.062** (0.049-0.083)	**0.071** (0.054-0.097)	**0.081** (0.061-0.118)	**0.094** (0.065-0.137)	**0.116** (0.077-0.176)	**0.136** (0.088-0.210)
10-day	**0.020** (0.016-0.024)	**0.025** (0.020-0.030)	**0.032** (0.026-0.040)	**0.039** (0.031-0.048)	**0.048** (0.037-0.063)	**0.054** (0.042-0.074)	**0.061** (0.046-0.089)	**0.071** (0.049-0.103)	**0.087** (0.058-0.131)	**0.101** (0.065-0.155)
20-day	**0.014** (0.012-0.017)	**0.017** (0.014-0.021)	**0.021** (0.017-0.026)	**0.024** (0.020-0.030)	**0.029** (0.023-0.038)	**0.032** (0.025-0.044)	**0.036** (0.027-0.051)	**0.041** (0.028-0.059)	**0.048** (0.032-0.072)	**0.055** (0.035-0.084)
30-day	**0.012** (0.010-0.015)	**0.014** (0.011-0.017)	**0.016** (0.014-0.020)	**0.019** (0.015-0.023)	**0.022** (0.017-0.028)	**0.024** (0.019-0.032)	**0.027** (0.020-0.037)	**0.030** (0.021-0.043)	**0.034** (0.023-0.051)	**0.038** (0.025-0.058)
45-day	**0.010** (0.008-0.012)	**0.011** (0.009-0.014)	**0.013** (0.011-0.016)	**0.015** (0.012-0.018)	**0.017** (0.013-0.022)	**0.019** (0.014-0.024)	**0.020** (0.015-0.028)	**0.022** (0.016-0.032)	**0.025** (0.017-0.037)	**0.027** (0.017-0.041)
60-day	**0.009** (0.007-0.011)	**0.010** (0.008-0.012)	**0.011** (0.009-0.014)	**0.012** (0.010-0.015)	**0.014** (0.011-0.018)	**0.015** (0.012-0.020)	**0.017** (0.012-0.023)	**0.018** (0.013-0.026)	**0.020** (0.013-0.029)	**0.021** (0.014-0.032)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

APPENDIX E

Operation and Maintenance

USJ O'Connell Athletic Center
West Hartford, CT

Regular inspection and maintenance of the stormwater management system and uphill areas is necessary to ensure proper operation. Inspections of the stormwater management system and pavement areas should be conducted monthly based on the following table:

Site Areas:

Inspection and Maintenance

Check for:	***Corrective Measure:***
Erosion	Install erosion control measures and provide stabilization measures
Spillage	Contain spill as close to source as possible with a dike of absorbent materials installed to protect drainage inlets, stormwater areas, or downstream wetlands and streams. All hazardous waste material, including absorbent materials must be disposed of by a licensed hazardous waste transporter and disposed of in an environmentally acceptable manner
Sediment Accumulation	Stabilize any disturbed areas uphill of where the sedimentation is occurring. Use temporary erosion control measures (i.e. silt fence, straw bales) to filter stormwater runoff.
Trash	Pick up and dispose of trash and litter in an environmentally acceptable manner.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Pavement Sweeping	Minimum two times per year: during spring cleanup (after last snow event) and during fall cleanup (to remove fallen leaves)
Pavement De-icing	Apply anti-icing treatment prior to storms Apply deicing treatments as needed during and after snow storms and mixed precipitation events to control ice and compact snow not removed during plowing

Catch Basins and Pipe:

Inspection and Maintenance

Check for:	***Corrective Measure:***
Trash, Sediment, and Debris at Grate	Remove trash, sediment, and debris and dispose of in an environmentally acceptable manner.
Sediment & Trash Accumulation in Sump	Remove sediment from sumps if depth of deposits is greater than one-half the depth from the bottom of the catch basin to the invert of the lowest pipe in the basin.
Pipe blockages	Flush pipes to remove blockages. TV inspect as required.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Minimum one time per year: Remove sediment and trash from catch basin sumps and grates and pipe inverts. Dispose of sediment and trash in an environmentally acceptable manner.

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Infiltration System

Inspection and Maintenance

Check for:	***Corrective Measure:***
Sediment Accumulation	Remove sediment when accumulation exceeds 3 inches throughout the length of the row per manufacturer's specifications.
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Inspected a minimum immediately after completion of the site's construction, every 6 months for the first year of operation and annually after the end of the first year. Remove sediment accumulation as required. Dispose of sediment in an environmentally acceptable manner.
Trash and Debris	Minimum once per year.

The infiltration system is to be inspected and maintained per manufacturer's specifications. Product information is attached.

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West Hartford, CT

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST

USJ O'Connell Athletic Center Date: Date Since Last Precipitation Event:	Time:	Inspector: Site Conditions:

Inspection Item	**Satisfactory? Yes (Y) or No (N)**		**Comments or Corrective Measures Taken**
Site Areas			
Erosion	Y	N	
Spillage	Y	N	
Sediment Accumulation	Y	N	
Trash	Y	N	
Catch Basins and Pipe			
Trash, Sediment, and Debris at Inlet Grates	Y	N	
Sediment & Trash Accumulation in Sump	Y	N	
Pipe blockages	Y	N	
Infiltration System			
Sediment Accumulation	Y	N	
Trash and Debris	Y	N	

UUF DI/CO

Product Detail Sheet

Product Description

The Ultra-Urban® Filter (UUF) with Smart Sponge® is an innovative low-cost BMP that helps meet NPDES permit and MS4 requirements. It is capable of removing sediment, hydrocarbons, heavy metals, bacteria, and phosphorus from water, as well as capturing trash, and debris. The Ultra-Urban Filter DI and CO series,designed for use in drop-in catch basin drains and curb inlet openings. AbTech can also custom fabricate any size filter to fit your application needs. On standard models are designed with stainless steel collar or mounting brackets with a corrogated recycled plastic filter. Alternative materials of construction can be provided depending on customer specification. With this design, trash and sediment accumulate in the upper basket chamber where they can be easily removed. Water then flows through the Smart Sponge® filtration media technology, where contaminants are absorbed.

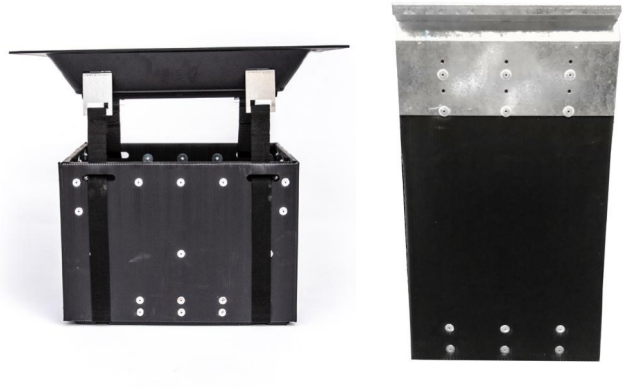
The Ultra-Urban filter with Smart Sponge meets or exceeds Stormwater Best Management Practices (BMP). AbTech offers non-point source pollution prevention and potential for long-standing treatment performance. The Ultra-Urban filter does not require modification of existing structures and is effective in fresh or salt water temperatures up to 130°F.

Frequent Applications

- Municipal, Industrial, and Construction Stormwater Drains
- Shopping Center Parking Lot Drains
- Parking Structures
- Airport Tarmac Drains and Fuel Farms
- Commercial Fuel Distributor Facilities
- Commercial and/or Residential Developments
- Truck Stops

Media Specifications

Applicable Technology	Targeted Contaminant
Smart Sponge	Hydrocarbons
Smart Sponge HM	Heavy Metals, Phosphorus, and Hydrocarbons
Smart Sponge Plus	Bacteria
Smart Sponge AC	Heavy Metals, phosphorus, and souluable/insoluable Hydrocarbons
Smart Sponge BC	Heavy Metals, Phosphorus, and Hydrocarbons



Disposal

The Smart Sponge samples saturated with hydrocarbons both in the lab and in the field have been tested according to the EPA's Toxicity Characteristic Leaching Procedure ("TCLP"). These tests show that Smart Sponge is a "non-leaching" (i.e., non-detect or "N.D.") product. As a result, Smart Sponge technology can afford many cost effective and environmentally friendly disposal options up to the user to pick from:

- Waste-to-Energy Facilities - A specialized segment of the solid waste industry has used spent Smart Sponge as an alternative fuel in the production of electricity.
- Cement Kilns - This industry has used the spent Smart Sponge as an alternative fuel in the production process of Portland Cement. This process is considered a beneficial reuse of waste products. The BTU value of spent Smart Sponge is consistently above the average acceptable levels set for this high temperature.
- Landfills - As discussed above, spent Smart Sponge products have been classified as a solid waste and have been accepted at Subtitle D Landfills.

Note: User responsible for proper disposal of the media

Performance

Independent testing performed by a qualified third party has confirmed the ability of the EOPU to remove:

- More than 80% Total Petroleum Hydrocarbons (TPH)
- More than 90% Trash and Debris (floatables)
- More than 80% Total Suspended Solids (TSS)
- More than 50% Total Phosphorus (Particulate and Soluble)
- More than 50% Total Metals (Particulate and Soluble)

Installation

Installation can be achieved typically in a very short time. For example, The Drain Inlet (DI) series Ultra-Urban Filter will suspend vertically from the drain into the catch basin through a structural mount and installation can be completed in as little as 10 minutes.